




AMERICAN COTTAGE GARDENS

PLANTS & GARDENS

BROOKLYN BOTANIC
GARDEN RECORD



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American Cottage Gardens

1990



Brooklyn Botanic Garden

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American Cottage Gardens

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Cover Photograph by Rob Procter, Procter-Macke garden

foreword

In recent years, as Americans have become more interested in gardening, we've continued to look to England for information, inspiration and even plants. When most people think of a cottage garden, they imagine it surrounding a thatched Cotswold cottage, and England's cottage gardens do have much to offer. But America has its own cottage gardens, as indeed every country has, though seldom thatched cottages to go along with them. In America, the tradition of growing a few well-loved plants near the door goes back to colonial times. The dooryard gardens of New England, the flower gardens based on shared and traded plants in the South, the enclosed front yard gardens of Texas—these are *our* cottage gardens.

Historically, cottage gardens occupied the area in front of a modest dwelling and were fenced or hedged to keep out livestock. The cottagers didn't own the property but worked the land for someone else, and gardening was done in the precious time left over after work was finished. Archaic as it may sound, this scenario isn't relegated to the distant past. During my high school years my family lived in Colorado. On the highway a few miles from our home lived a rancher's hired hand and his family in a house provided by his employer. The tiny yard was fenced to protect it from straying animals, because cattle drives are a frequent summer occurrence on the highways. The hired man's wife, who I'm sure had her own ranch work to do, couldn't devote lots of time or space to gardening, but she grew lovely flowers in the front yard. I remember particularly the fragrant sweet peas growing up the wire fence. This isn't an isolated instance: Many families in those valleys today lead the same life.

There is a great deal of freedom in cottage gardening, which may be the primary reason it is so appealing. There is an element of chance. As plants are allowed to self-sow they seem to move about on their own (though usually under the gently guiding hand of the gardener), and the look of the garden changes subtly from year to year. This is not to suggest that a cottage garden is not arranged or designed, or that plants are put in without thought of how they will look with their neighbors. A haphazard mix of plants is usually a hodge-podge, and that's not a cottage garden—that's a mess.

Like a good Brunswick stew or clam chowder, there are a few essential ingredients in a cottage garden. It is often a mix of many types of plants—annuals, perennials, herbs, vines, shrubs, even vegetables—many of which may have been shared by friends and neighbors. These may be arranged according to the fancy of the gardener or as dictated by necessity, but the effect is intimate, personal, charming and casual. The result is a garden of cheerful atmosphere where the gardener can indulge a love of plants.

Ruth Robde Haskell
Guest Editor

Ruth Robde Haskell, guest editor of this handbook, was Associate Editor of Flower & Garden for ten years. Her book on perennials will soon be published. She is now an associate editor for Fine Gardening magazine.

A cottage garden is often a mix of many types of plants—annuals, perennials, herbs, vines, shrubs and even vegetables. Pictured here are one of grandmother's favorites—hollyhocks—marching in a line to the front door.



FRONT DOORYARDS

"There are few of us who cannot remember a front yard garden which seemed to us a very paradise in childhood. Whether the house was a fine one and the enclosure spacious, or whether it was a small house with only a narrow bit of ground in front, the yard was kept with care, and was different from the rest of the land altogether. . . . People do not know what they lose when they make way with the reserve, the separateness, the sanctity, of the front yard of their grandmothers. It is like writing down family secrets for anyone to read; it is like having everybody call you by your first name, or sitting in any pew in church."

Country Byways
Sarah Orne Jewett, 1881



A Garden at Ardmore, Pennsylvania circa 1910.

Alice Morse Earle

Old New England villages and small towns and well kept New England farms had universally a simple and pleasing form of garden called the front yard or front dooryard. A few still may be seen in conservative communities in the New England states and in New York or Pennsylvania. I saw flourishing ones this summer in Gloucester, Marblehead and Ipswich. Even where the front yard was but a narrow strip of land before a tiny cottage, it was carefully fenced in, with a gate that was kept rigidly closed and

Alice Morse Earle (1853–1911) was born in Massachusetts, but moved to Brooklyn Heights, NY after her marriage. Old Time Gardens, a classic in American garden literature, is just one of a number of gardening books she wrote. She is known to have corresponded with Gertrude Jekyll.

latched. There seemed to be a law which shaped and bounded the front yard; the side fences extended from the corners of the house to the front fence on the edge of the road, and thus formed naturally the guarded parallelogram. Often the fence around the front yard was the only one on the farm; everywhere else were boundaries of great stone walls; or if there were rail fences, the front yard fence was the only painted one. I cannot doubt that the first gardens that our foremothers had, which were wholly of flowering plants, were front yards, little enclosures hard won from the forest.

The word yard, not generally applied now to any enclosure of elegant cultivation, comes from the same root as the word garden. Garth is another derivative and the word exists much disguised in

orchard. In the 16th century yard was used in formal literature instead of garden; and later Burns writes of "Eden's bonnie yard, Where youthful lovers first were pair'd."

This front yard was an English fashion derived from the forecourt so strongly advised by Gervase Markham (an interesting old English writer on floriculture and husbandry), and found in front of many a yeoman's house, and many a more pretentious house as well in Markham's day. Forecourts were common in England until the middle of the 18th century, and may still be seen. The forecourt gave privacy to the house even when in the centre of town. Its readoption is advised with handsome dwellings in England, where ground-space is limited—and why not America, too?

The front yard was sacred to the best beloved, or at any rate the most honored, garden flowers of the house mistress, and was preserved by its fences from inroads of cattle, which then wandered at their will and were not housed, or even enclosed at night. The flowers were often of scant variety, but were those deemed the gentlefolk of the flower world. There was a clump of daffodils and of the poet's narcissus in early spring, and stately crown imperial; usually, too, a few scarlet and yellow single tulips, and grape hyacinths. Later came phlox in abundance—the only native American plant—canterbury bells and ample and glowing London pride. Of course there were great plants of white and blue daylilies, with their beautiful and decorative leaves, and purple and yellow flower de luce. A few old-fashioned shrubs always were seen. By inflexible law there must be a lilac, which might be the aristocratic Persian lilac. A *Syringa*, flowering currant or strawberry bush made sweet the front yard in spring, and sent wafts of fragrance into the house-windows. Spindling, rusty snowberry bushes were by the gate, and snowballs also, or our native viburnums. Old as they seem, the spiraeas and deutzias came to us in the

19th century from Japan; as did the flowering quinces and cherries. The pink flowering almond dates back to the oldest front yards and Peter's wreath certainly seems an old settler and is found now in many front yards that remain.

The glory of the front yard was the old-fashioned early red "piny," cultivated since the days of Pliny. I hear people speaking of it with contempt as a derogatory adjective—but I glory in its flaunting. The modern varieties, of every tint from white through flesh color, coral, pink, ruby color, salmon and even yellow, to deep red, are as beautiful as roses. Some are sweet-scented; and they have no thorns, and their foliage is ever perfect, so I am sure the rose is jealous.

I am as fond of the peony as are the Chinese, among whom it is flower queen. It is by them regarded as an aristocratic flower; and in old New England towns fine peony plants in an old garden are pretty good indication of the residence of what Dr. Holmes called New England Brahmins. In Salem and Portsmouth are old "pinys" that have a hundred blossoms at a time—a glorious sight. A Japanese name is "flower-of-prosperity"; another name, "plant-of-twenty-days," because its glories last during that period of time.

Rhododendrons are to the modern garden what the peony was in the old-fashioned flower border; and I am glad the modern flower cannot drive the old one out. They are equally varied in coloring, but the peony is a much harder plant, and I like it far better. It has no blights, no bugs, no diseases, no running out, no funguses; it doesn't have to be covered in winter and it will bloom in the shade. No old-time or modern garden is to me fully furnished without peonies. I would grow them in some corner of the garden for their splendid healthy foliage if they hadn't a blossom. The *Paeonia tenuifolia* in particular has exquisite feathery foliage. The great tree peony, which came from China, grows eight feet or more in height,



A Garden at Bar Harbor, Maine.

and is a triumph of the flower world; but was not known in the oldest front yards. Some of the tree peonies have finely displayed leafage of a curious and very gratifying tint of green. Miss Jekyll, with her usual felicity, compares its blue cast with pinkish shading to the vari-colored metal alloys of the Japanese bronze workers—a striking comparison. The single peonies of recent years are of great beauty, and will soon be esteemed here as in China.

Not the least of the peony's charms is its exceeding trimness and cleanliness. The plants always look like a well dressed, well shod, well gloved girl of birth, breeding and of equal good taste and good health; a girl who can swim, and skate, and ride and play golf. Every inch has a well set, neat, cared-for look which the shape and growth of the plant keeps from seeming artificial or finicky.

No flower can be set in our garden of more distinct antiquity than the peony; the Greeks believed it to be of divine origin. A green arbor of the 14th century in England

is described as set around with gillyflower, tansy, gromwell and "pyonys powdered ay betwene"—just as I like to see peonies set to this day, "powdered" everywhere between the other flowers of the border.

I am pleased to note of the common flowers of the New England front yard, that they are no new things; they are nearly all Elizabethan of date—many are older still. Lord Bacon in his essay on gardens names many of them, crocus, tulip, hyacinth, daffodil, flower de luce, double peony, lilac, lily of the valley.

A favorite flower was the yellow garden lily, the lemon lily, *Hemerocallis*, when it could be kept from spreading. Often its unbounded luxuriance exiled it from the front yard to the kitchen dooryard. Its pretty old-fashioned name was liriconfancy, given, I am told, in England to the lily of the valley. I know no more satisfying sight than a good bank of these lemon lilies in full flower.

The time of fullest inflorescence of the 19th century front yard was when phlox and tiger lilies bloomed; but the pinkish-orange colors of the latter (the oddest reds of any flower tints) blended most vilely and rampantly with the crimson-purple of the phlox; and when London pride joined with its glowing scarlet, the front yard fairly ached. Nevertheless, an adaptation of that front-yard bloom can be most effective in a garden border, when white phlox only is planted, and the tiger lily or cultivated stalks of our wild nodding lily rise above the white trusses of bloom. These wild lilies grow very luxuriantly in the garden, often towering above our heads and forming great candelabra bearing two score or more blooms. It is no easy task to secure their deep-rooted rhizomes in the meadow. I know a young man who won his sweetheart by the patience and assiduity with which he dug for her all one broiling morning to secure for her the coveted lily roots, and col-

lapsed with mild sunstroke at the finish. Her gratitude and remorse were equal factors in his favor.

The tiger lily is usually thought upon as a truly old-fashioned flower, a veritable antique; it is a favorite of artists to place as an accessory in their colonial gardens, and of authors for their flower-beds of Revolutionary days, but was not known either in formal garden or front yard until after "the days when we lived under the King." The bulbs were first brought to England from Eastern Asia in 1804 by Captain Kirkpatrick of the East India Company's Service, and shared with the Japan lily the honor of being the first Eastern Lilies introduced into European gardens. A few years ago an old gentleman, Mr. Isaac Pitman, who was then about 85 years of age, told me that he recalled distinctly when tiger lilies first appeared in our gardens, and where he first saw them growing in Boston. So instead of being an

This old illustration shows a combination of rose loosestrife, white mullein, mullein pinks and yellow knapweed. The colors blend nicely.



old-time flower, or even an old-comer from the Orient, it is one of the novelties of this century. How readily has it made itself at home, and even wandered wild down our roadsides!

The two simple colors of phlox of the old-time front yard, white and crimson-purple, are now augmented by tints of salmon, vermilion and rose. I recall with special pleasure the profuse garden decoration at East Hampton, Long Island, of a pure cherry-colored phlox, generally a doubtful color to me, but there so associated with the white blooms of various other plants, and backed by a high hedge covered solidly with blossoming honeysuckle, that it was wonderfully successful.

To other members of the phlox family, all natives of our own continent, the old front yard owed much; the moss pink sometimes crowded out both grass and its companion the periwinkle; it is still found in our gardens, and bountifully also in our fields; either in white or pink, it is one of the satisfactions of spring, and its cheerful little blossom is of wonderful use in many waste places. An old-fashioned bloom, the low-growing *Phlox amoena*, with its queerly fuzzy leaves and bright crimson blossoms, was among the most distinctly old-fashioned flowers of the front yard. It was tolerated rather than cultivated, as was its companion, the *Arabis* or rock cress—both crowding, monopolizing creatures. I remember well how they spread over the beds and up the grass banks in my mother's garden, how sternly they were uprooted, in spite of the pretty name of the *Arabis*—"snow in summer."

Sometimes the front yard path had edgings of sweet single or lightly double white or tinted pinks, which were not deemed as choice as box edgings. Frequently large box plants clipped into simple and natural shapes stood at the side of the doorstep, usually in the homes of the well-to-do. A great shell might be on either side of the doorsill, if there chanced

to be seafaring men-folk who lived or visited under the roof-tree. Annuals were few in number; sturdy old perennial plants of many years' growth were the most honored dwellers in the front yard, true representatives of old families. The roses were few and poor, for there was usually some great tree just without the gate, an elm or larch, whose shadow fell far too near and heavily for the health of roses. Sometimes there was a prickly semidouble yellow rose, called by us a Scotch rose, a sweet brier or a rusty-flowered white rose, similar, though inferior, to the Madame Plantier. A new fashion of trellises appeared in the front yard about 60 years ago, and crimson Boursault roses climbed up them as if by magic.

One marked characteristic of the front yard was its lack of weeds; few sprung up, none came to seed-time; the enclosure was small, and it was a mark of good breeding to care for it well. Sometimes, however, the earth was covered closely under shrubs and plants with the cheerful little ladies' delights, and they blossomed in the chinks of the bricked path and under the box edges. Ambrosia, too, grew everywhere, but these were welcome—they were not weeds.

Our old New England houses were suited in color and outline to their front yards as to our landscape. Lowell has given in verse a good description of the kind of New England house that always had a front dooryard of flowers.

*"On a grass-green swell
That towards the south with sweet
concessions fell,
It dwelt retired, and half had grown to be
As aboriginal as rock or tree.
It nestled close to earth, and seemed to brood
O'er homely thoughts in a half-conscious
mood.
If paint it e'er had known, it knew no more
Than yellow lichens spattered thickly o'er
That soft lead gray, less dark beneath the
eaves*

*Which the slow brush of wind and weather
leaves
The ample roof sloped backward to the
ground
And vassal lean-tos gathered thickly
round,
Patched on, as sire or son had felt the need.
But the great chimney was the central
thought.
It rose broad-shouldered, kindly, debonair,
Its warm breath whitening in the autumn
air."*

Sarah Orne Jewett, in the plaint of *A Mournful Villager*, had drawn a beautiful and sympathetic picture of these front yards, and she deplores their passing. I mourn them as I do every fenced-in or hedged-in garden enclosure. The sanctity and reserve of these front yards of our grandmothers was somewhat emblematic of woman's life of that day: it was restricted, and narrowed to a small outlook and monotonous likeness to her neighbor's; but it was a life easily satisfied with small pleasures, and it was comely and sheltered and carefully kept, and pleasant to the home household; and these were no mean things.

The front yard was never a garden of pleasure; children could not play in these precious little enclosed plots, and never could pick the flowers—front yard and flowers were both too much respected. Only formal visitors entered therein, visitors who opened the gate and closed it carefully behind them, and knocked slowly with the brass knocker, and were ushered in through the ceremonious front door and the little ill-contrived entry, to the stiff foreroom or parlor. The parson and his wife entered that portal, and sometimes a solemn would-be sweetheart, or the guests at a tea party. It can be seen that everyone who had enough social dignity to have a front door and had a parlor, and visitors thereto, also desired a front yard with flowers as the external token of that honored standing. It was like owning a

pew in church; you could be a Christian without having a pew, but not a respected one. Sometimes when there was a "vendue" in the house, reckless folk opened the front gate, and even tied it back. I attended one where the auctioneer boldly set the articles out through the windows under the lilac bushes and even on the precious front yard plants. A vendue and a funeral were the only gatherings in country communities when the entire neighborhood came freely to an old homestead, when all were at liberty to enter the front dooryard. At the sad time when a funeral took place in the house, the front gate was fastened widely open, and solemn men-neighbors, in Sunday garments, stood rather uncomfortably and awkwardly around the front yard as the women passed into the house of mourning and were seated within. When the sad services began, the men too entered and stood stiffly by the door. Then through the front door, down the mossy path of the front yard and through the open front gate was borne the master, the mistress, and then their children, and children's children. All are gone from our sight, many from our memory, and often too from our ken, while the lilacs and peonies and flowers de luce still blossom and flourish with perennial youth, and still claim us as friends.

At the side of the house or by the kitchen door would be seen many thrifty blooms: poles of scarlet runners, beds of portulacas and petunias, rows of pinks, bunches of marigolds, level expanses of sweet williams, banks of cheerful nasturtiums, tangles of morning-glories and long rows of stately hollyhocks, which were much admired, but were seldom seen in the front yard, which was too shaded for them. Weeds grew here at the kitchen door in a rank profusion which was hard to conquer; but here the winter's fuchsias or geraniums stood in flower pots in the sunlight, and the tubs of oleanders and agapanthus lilies.

The flowers of the front yard seemed to bear a more formal, a "company" aspect; conventionality rigidly bound them. Bachelor's buttons might grow there by accident, but marigolds never were tolerated—they were pot herbs. Sunflowers were not even permitted in the flower beds at the side of house unless these stretched down to the vegetable beds. Outside the front yard would be a rioting and cheerful growth of pink bouncing bet, or of purple honesty, and tall straggling plants of a certain small flowered, ragged *Campanula*, and a white mallow with flannelly leaves which, doubtless, aspired to inhabit the sacred bounds of the front yard (and probably dwelt there originally), and often were gladly permitted to grow in side gardens or kitchen dooryards, but which were regarded as interloping weeds by the guardians of the front yard, and sternly exiled. Sometimes a bed of these orangetawny daylilies which had once been warmly welcomed from the Orient, and now were not wanted anywhere by anyone, kept company with the bouncing bet, and stretched cheerfully down the roadside.

When the fences disappeared with the night rambles of the cows, the front yards gradually changed character; the tender blooms vanished, but the tall shrubs and the peonies and flower de luce sturdily grew and blossomed, save where that dreary destroyer of a garden crept in—the desire for a lawn. The result was then a meagre expanse of poorly kept grass, with no variety, color or change—neither lawn nor front yard. It is ever a pleasure to me when driving in a village street or a country road to find one of these front yards still enclosed, or even to note in front of many houses the traces of a past front yard still plainly visible in the flourishing old-fashioned plants of many years' growth. 🌸

Excerpted from Alice Morse Earle's Old-Time Gardens, 1901.

Herbs in a SMALL CITY GARDEN

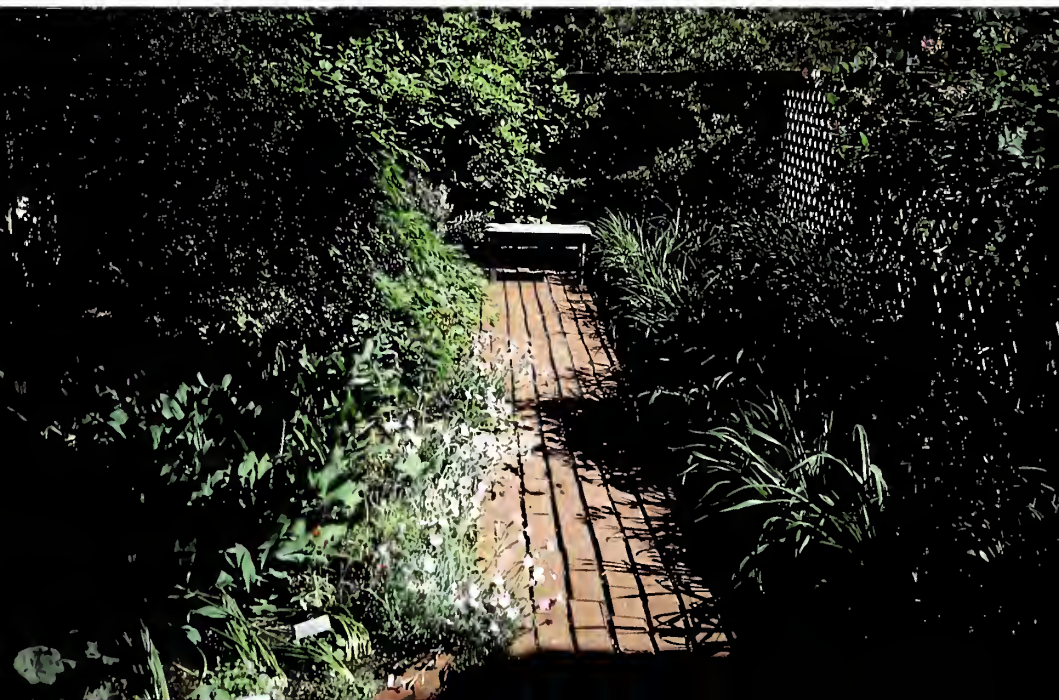
Virginia & Sarah Weatherly

Growing herbs with our perennials—in fact, mixing all our plants including shrubbery—has become so natural that we have forgotten that at one time we had customary perennial, cutting, herb and vegetable gardens. When we moved from family property with large gardens to a pocket-size city lot, we had many changes to consider.

First was the size, as the house and grounds were only 75 feet by 150 feet. Unbelievable as it seems there were 13 huge trees on this small space—mostly

American elms. Even though three trees were removed, there was very little sunlight. Shade gardening was a new experience for us. Our mother, a knowledgeable and self-taught horticulturist, set to work researching shade-loving plants and recording data on sunlight in various parts of the property. During a rainstorm it was

Having so little space, the authors realized that every square inch had to be cultivated if they were to enjoy some of the plants that they wanted to grow. Pictured here is crape-myrtle walk.





Grass walk ends with an inviting bench—a place to sit and enjoy the garden and watch the birds that come to the feeders. Many of the plants in the garden are fragrant so that the gentle breezes waft the mingled scents.

not unusual to see her walking around the garden under an umbrella diagraming the flow of the water. All of this resulted in placing essential plants in spots where they would have a reasonable chance of survival. It was surprising that this mixture of plants could evolve into a fairly artistic and homogeneous garden.

Having so little ground, we finally realized that every square inch must be cultivated if we were to enjoy some of the plants that we felt were indispensable. Mother designed patterned beds into small gardens, giving each of them names.

Virginia and Sarah Weatherly have been gardening the same plot in Kansas City for 45 years. They keep extensive records which include the source of each plant and the date it was planted.

The Sweet Herb Garden has 12 small beds joined by a partially bricked path covered with creeping thyme. Two very small beds are filled with *Nepeta mussinii*. Two more are planted with *Dictamnus alba*. An ideal spot was found here for French tarragon. Pink, blue and white hyssop edged one side while black (now red) raspberry canes climb the fence on another side. The texture of tough herbs like costmary and rue blend well and fill large and more difficult spots. Throughout this garden species bulbs are planted for early spring bloom, succeeded by hardy lilies and then *Allium tanguticum*. One of the criteria is fragrance. In the early shady garden days, color was at a premium, so sweet william (*Dianthus barbatus*) 'Newport Pink' was very welcome. Yarrow blooms all summer, as do coralbells. Dianthus cover any bare ground along with a wonderful johnny-jump-up, *Viola tricolor* 'Black Imp', which self-sows.

To our great joy two peony and hybrid rose beds could become our vegetable garden after the Dutch Elm disease destroyed all the elms. Naturally some of

the annual culinary herbs are placed here. Climbing nasturtiums usually make a background for these vegetables. Throughout this area dill self-sows and as it is so pretty, it is allowed to remain until it interferes with other plants.

Our Grass Walk is on the western edge of the property. Originally only deep shade-loving plants could survive, such as hostas and ferns. Now there are five fruit trees, peonies, two old roses ('Gruss an Aachen' and 'Old Blush'), anemones (*A. japonica*, *sylvestris*, *vitifolia*), *Physostegia*, meadowrue (*Thalictrum*) and the original plants—celandine, bergamot, *Colchicum autumnale*, sweet woodruff, *Daphne cneorum* and *D. burkwoodii*, wild sweet william (*Phlox divaricata*), various ferns and ground covers (lamiums, sweet woodruff and epimediums) enjoy the additional sun. These, with six Exbury azaleas, a yew, two small hollies, climbing clematis on the board fence and a hydrangea have become very happy companions even though a sawtooth oak tree is rapidly growing to gigantic proportions.

Moving eastward on the property, we always had more morning sun and so could have color. A hedge of old roses (moss, damask, cabbage and hybrid musk) screen this side. This is underplanted with wildflowers and ground covers (wild ginger and grandiflora primroses). *Aruncus* does well here.

This area is the background for our perennial garden, which is six raised beds. The focal point is a small circular bed with a lead figure of St. Francis surrounded by 'Hidcote' and 'Munstead' lavender. These plants seed in the sand of the brick paths and over the years we have been able to edge two sides of each of three beds. The other sides are edged with Korean box which were rooted trimmings from the hedge in front. There are many bulbs in the spring, and they, with *Ribes aureum* (Missouri currant), provide wonderful early fragrance. The continuous bloom

comes from *Lythrum* 'Morden's Pink', *Thalictrum glaucum*, yarrow (*Achillea taygetea*), *Veronica* 'Minuet' and *V. spicata* 'Red Fox', phlox, *Digitalis* (foxglove), valerian (*Centranthus ruber*), *Clematis integrifolia* and *C. recta*, many varieties of alliums, *Aster frikarii*, *Delphinium x bel-ladonna* and hybrid lilies.

Two narrow rectangular beds are on either side of the above four. The one with the least sun contains garden sage, variegated sage, coreopsis, *Amsonia*, *Stokesia*, *Santolina virens* and *S. chamaecyparissus*, *Veronica prostrata* 'Heavenly Blue' and *Scabiosa*. Throughout the garden many varieties and colors of dianthus and sweet william are scattered where there is a bare square inch.

The sixth bed is for culinary herbs. This is the only section that is not a mixture. As this bed is the foreground to the perennial gardens seen from the brick terrace, the basil, chives, thymes, lovage, rosemary, pineapple sage, fern-leaf tansy, oregano, salad burnet, winter and summer savorys, sorrel, parsleys and sweet marjoram make a nice contrast of greens.

The beds edging the brick terrace and front porch also have some herbs. Lady's-mantle (*Alchemilla*), *Helleborus orientalis*, clary sage, Jacob's ladder (*Polemonium*) and sweet cicely are happy under *Calycanthus*, dwarf crape-myrtle and *Exochorda* 'The Bride'.

In containers on the terrace, we have lemon verbena, many scented-leaved geraniums, tender ivies and sweet bay (*Laurus nobilis*).

Throughout the property white nicotiana and feverfew self-sow and are allowed to stay if they do not crowd out another plant.

We realized very early that we did not have enough space for some weedy but fragrant herbs, so we went outside to the parking area with these. Here we could let bronze fennel, lemon balm, *Artemisia ludoviciana* 'Silver King', many mints and

common tansy spread to their hearts' content. This planting is very popular with the joggers.

As many herbs are spreaders, caution must be used in combining them with perennials and shrubbery. What started as a necessity for us has now become a way of gardening, and we recommend using all plants in any spot that will artistically or horticulturally please you. 🌸

Plant List

Herbs:	
<i>Artemisia ludoviciana</i>	'Silver King'
Basil	<i>Ocimum basilicum</i>
Bergamot	<i>Monarda didyma</i>
Wood Betony	<i>Stachys officinalis</i>
Catmint	<i>Nepeta mussinii</i>
Celandine	<i>Chelidonium majus</i>
Chives	<i>Allium schoenoprasum</i>
Chervil	<i>Anthriscus cerefolium</i>
Costmary	<i>Chrysanthemum balsamita</i>
Dill	<i>Anethum graveolens</i>
Feverfew	<i>Chrysanthemum parthenium</i>
Germander	<i>Teucrium chamaedrys</i>
Heartsease	<i>Viola x wittrockiana</i>
Horehound	<i>Marrubium vulgare</i>
Jacob's-ladder	<i>Polemonium caeruleum</i>
Lady's-mantle	<i>Alchemilla vulgaris</i>
Lavender	<i>Lavandula officinalis</i>
Lemon balm	<i>Melissa officinalis</i>
Lemon verbena	<i>Aloysia triphylla</i>
Lovage	<i>Levisticum officinale</i>
Pot Marigold	<i>Calendula officinalis</i>

Marjoram	<i>Origanum marjorana</i>
Mint	<i>Mentha piperita, spicata, rotundifolia</i>
Nasturtium	<i>Tropaeolum majus</i>
<i>Nicotiana</i> spp.	
Oregano	<i>Origanum vulgare</i>
Orris root	<i>Iris x germanica</i>
Parsley	<i>Petroselinum crispum</i>
Periwinkle	<i>Vinca minor</i>
Rosemary	<i>Rosmarinus officinalis</i>
Rue	<i>Ruta graveolens</i>
Sages	<i>Salvia officinalis, S. pratensis</i> (clary), <i>S. elegans</i> (pineapple)
Salad burnet	<i>Poterium sanguisorba</i>
Santolinas	<i>Santolina virens</i> (green), <i>S. chamaecyparissus</i> (lavender cotton, gray)
Savory	<i>Satureja hortensis</i> (summer), <i>S. montana</i> (winter)
Scented-leaf geraniums	<i>Pelargonium</i> spp.
Sorrel, French	<i>Rumex scutatus</i>
Sweet bay	<i>Laurus nobilis</i>
Sweet Cicely	<i>Myrrhis odorata</i>
Tansy	<i>Tanacetum vulgare, T. vulgare crispum</i> (fern-leaf tansy)
Tarragon, French	<i>Artemisia dracunculus</i>
Thyme	<i>Thymus vulgaris</i> (common), <i>T. serpyllum</i> cvs., <i>T. x citriodorus</i> (lemon)

Valerian	<i>Centranthus ruber</i>
Sweet woodruff	<i>Galium odoratum</i>
Yarrow	<i>Achillea taygetea</i>

Poisonous Drug Herbs:

Meadow saffron	<i>Colchicum autumnale</i>
Foxglove	<i>Digitalis</i> spp.
Guinea-hen flower	<i>Fritillaria meleagris</i>
Lenten rose	<i>Helleborus orientalis</i>

Scented and Aromatic Shrubs:

Carolina allspice	<i>Calycanthus floridus</i>
Blue mist	<i>Caryopteris x clandonensis</i>
<i>Daphne cneorum</i> and <i>D. burkwoodii</i>	
Witch hazel	<i>Hamamelis virginiana</i>
Honeysuckle	<i>Lonicera heckrottii</i>
Mock-orange	<i>Philadelphus</i> spp.
Missouri currant	<i>Ribes aureum</i>
<i>Viburnum carlesii</i>	

A large sweet bay tree occupies a large tub on the terrace. The beds edging this area have herbs, lady's mantle, clary sage, jacob's ladder, sweet cicely, crape-myrtle and lenten rose.



Antique Plants for MODERN COTTAGE GARDENS

Arthur O. Tucker

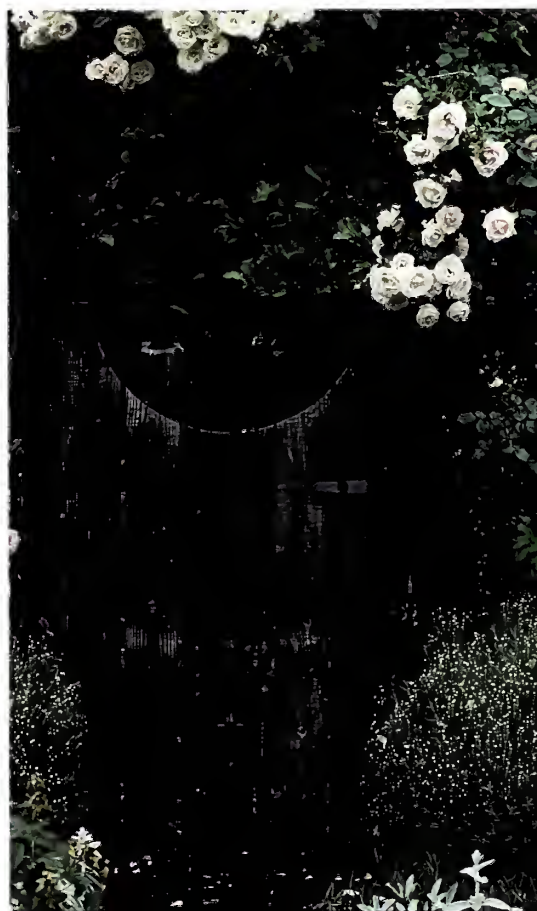
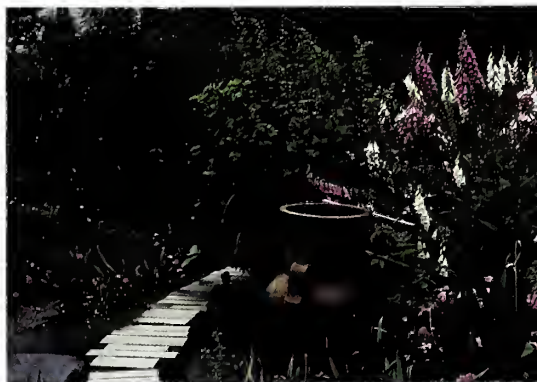
If cottage gardening could be distilled to an essence, it would include an exuberance of growth, color and scent. This style of gardening was originally dictated by the plants themselves. While the cottage garden revival often includes the classic vision of an English thatched cottage, the vernacular gardens of our North American ancestors were essentially cottage gardens, and their plants are perfect for this style.



Above: A cottage garden borders the walkway leading to the house and contains showy foxgloves and Achillea 'Moonshine'.

Top Right: Foxgloves are combined with roses, Lysimachia ciliata (left rear) and Silene dioica 'Flore Pleno' which dates to pre-1581.

Right: 'New Dawn' roses of the 1930s envelop this archway. Planted at the base are lavender cotton and lamb's ears.



Arthur O. Tucker is a Research Professor in the Department of Agriculture and Natural Resources at Delaware State College in Dover, Delaware. He has published on the systematics, chemistry and agronomic management of herbs and essential oil plants, but his private passion is saving antique cultivars of ornamental plants.

Ironically, the best source of antique plants for cottage gardens is consistently ignored: neighborhood gardens. Common plants quickly become considered vulgar and are often ignored by "sophisticated" gardeners who demand the latest cultivars described in glowing terms in the catalogs. Elizabeth Lawrence was one of the first Americans to write of the treasures in our own backyards that are, as a bonus, regionally adapted.

A good example is grandmother's early blue iris (*Iris germanica*). With blue standards and purple-blue falls, this is probably the very first intermediate tall bearded iris to bloom in neighborhood gardens of the northeastern U.S. It probably dates back to the ninth century A.D., and was a subject of Van Gogh's floral paintings in 1889. 'Honorabile' (1840), a miniature tall bearded with yellow standards and yellow falls solidly veined with maroon-red, is another very common iris of our old gardens. Gradually, specialty iris nurseries are again offering antique irises, and HIPS (Historic Iris Preservation Society) further acts to preserve these treasures. While modern irises flaunt their superb beauty, they demand to be used as accent plants or planted *en masse* with other irises, but the old irises blend beautifully into a perennial border.

Perhaps no flowers are more characteristic of cottage gardens of North America than the old roses. Again, dooryard gardens show regional adaptability, with old teas and noisettes in the southeastern U.S. and hybrid provences and hybrid chinas in the northeastern states. 'Banshee' (c. 1773), probably a hybrid of *R. damascena* and *R. blanda*, exists in up to nine different forms scattered across North America! 'Bella Donna' (pre-1829), 'Pink Leda' (c. 1840), and 'Shailer's Provence' (1799) are only occasionally available at specialty nurseries, yet cloak the graveyards and farmyard gardens throughout the mid-Atlantic region. On their own roots these all suck-



er, and their widespread distribution alludes to frequent passes over the back fence. Thanks to the Heritage Rose Group, these roses of our ancestral gardens are being preserved. Join these specialty groups to learn more and perhaps acquire plants!

The American gardener was, in years past, the recipient of the fruits of the English "florist," or one who devoted himself to the breeding of one particular flower. *Dianthus* and *Primula* are only two genera of such florist flowers. Derivatives of the cottage pink (*D. plumarius*), clove pink (*D. caryophyllus*), and their hybrids are often found in old American gardens. 'Gloriosa' (late 18th century), a sumptuous pink/carnation hybrid full of clove fragrance, was found growing in a garden in Seattle. The most common primulas in American gardens are variants of the old brick-red polyanthus (*P. x polyantha*), which date back to at least the 17th century and seem resistant to the heat and humidity of an American summer (unlike their hybrid derivatives, the 'Pacific Giants'). The old sulfur yellow, a selection of *P. x media*, is also characteristic of neighborhood gardens of the U.S. and dates back to before 1601.

Daylilies, daffodils and peonies are appropriate to a cottage garden and persist in our gardens long after the old traces of man decay around them. The most common daylily of our roadsides is a sterile clone, *Heemerocallis fulva* 'Europa', which

must be propagated vegetatively; it dates from before 1567. The double fulvous-orange daylily may be found as either the green reversion of 'Kwanso' (introduced with variegated foliage in 1864 but reverted to all green by 1917), or 'Flore Pleno' (1860). While I have often heard that gardeners have the true lemon lily (*H. lilioasphodelus*, formerly *H. flava*, of 1570), invariably it turns out to be 'Hyperion', introduced in 1925. The most common daffodil of our old gardens in the U.S. has earned the colloquial name of 'Butter and Eggs', but is more correctly called 'Telaemonius Plenus' or 'Van Sion'. This sloppy double yellow daffodil, often bearing streaks of green, was listed by Parkinson in 1629 as "Mr. Wilmer's great double daffodill." If you order this daffodil from commercial sources, you inevitably receive 'Plenus', which is just as old but usually bears only a double cup, though sometimes the doubling extends to the entire perianth. Another common daffodil is 'Primrose Peerless', which was also mentioned by Parkinson; it bears a pale yellow cup against white perianth segments, usually with two flowers per scape. The antique peonies in our old gardens are almost impossible to identify, but the old red piney ('Rosea Plena') of pre-1597 and the fern-leaved peony (*Paeonia tenuifolia* 'Plena') of 1765 are some to treasure. Peony nurseries also offer old cultivars such as 'Avalanche' (1886), 'Edulis Superba' (1824), 'Felix Crousse' (1881), 'Festiva Maxima' (1851), 'Grover Cleveland' (1904), 'Karl Rosenfeld' (1908), 'Mikado' (1893), 'M. Jules Elie' (1888) and 'Sarah Bernhardt' (1906).

Don't neglect the vines, so essential for a touch of romanticism in a cottage garden. Wisteria and Hall's Japanese honeysuckle (*Lonicera japonica* 'Halliana') abound in our old gardens. A real treasure is the hardy fragrant jasmine, *Jasminum officinale*. A painting of William Bartram by Charles Wilson Peale, done in 1808,

shows this jasmine, which is hardy to Philadelphia. Many old cultivars of English ivy (*Hedera helix*) seem to be perfectly hardy to at least Zone 6. Choose such ivies as 'Atropurpurea' (1882), 'Conglomerata' (1871), 'Dealbata' (1872), 'Deltoidea' (1871), 'Sulphurea' (1872) or 'Tricolor' (1860).

Window boxes and pots of antique house plants round out the picture. *Pelargonium inquinans*, the first geranium brought to the U.S., was painted by Rubens Peale in 1801, while the variegated, non-flowering 'Mme. Salleron' geranium (1845-50) was a favorite for Victorian bedding-out schemes.

Many other treasures are also found in neighborhood gardens, but watch out for the "trifids," or those that propagate themselves excessively and become impossible to eradicate, such as the variegated goutweed (*Aegopodium podagraria* 'Variegatum'). On the other hand, Gerard's "ladies' laces," or ribbon grass (*Phalaris arundinacea picta*) of pre-1597 is attractive in the garden and bouquets, but easily removed, as is the creeping double yellow buttercup (*Ranunculus repens* 'Pleniflorus') of pre-1629. Any garden that sports the old doubles and spurless doubles of the common columbine (*Aquilegia vulgaris* 'Flore Pleno' and 'Stellata') of pre-1572 will have them forever; the parent plants only last about three years, but their descendants become scattered all over the garden. These examples can become weeds, but what delightful weeds!

Become aware of what our ancestors grew by seeking out your neighborhood gardens. Just as an interior decorator cannot go to the corner department store and choose a coordinated room of Pennsylvania German antiques, you cannot just open up a catalog and select a complete cottage garden that reflects *you* and your specific gardening conditions. Besides, you may also make some new friends in the role of a plant preservationist. 🌿

First-year Cottage Garden

Ray Rogers

My tiny cottage garden grew out of a longstanding wish to create a green space where I lived. After residing in gardenless apartments for several years, an opportunity to move into the first floor of a house in New Brunswick, New Jersey arose. One of the house's major assets was the roughly 18 foot by 50 foot gardenable patch in the back. I jumped at the chance to fulfill my wish and, even before moving in that fall, I was busy building my own garden.

*The author photographed in his New Brunswick, New Jersey first-year garden inspecting a pot of *Rosmarinus officinalis* 'Prostratus.'*





The garden walk photographed in late September. Among the plants photographed are: blue Aster 'Monch', red Sedum 'Autumn Joy', gray Artemisia 'Powis Castle'.

I began by inventorying the site conditions and improving undesirable ones whenever possible. Light ranged from full sun near the house to no direct sun in the rear; neighboring buildings provided wind protection for most of the site; and the soil worked easily and held moisture well. A newly laid asphalt parking area along the north and east, a picket fence and lawn to the west and a garage and three-story house along the south and southeast bordered the area. Piles of pebbles and mulch lay all over. As I dug around, I unearthed plastic sheets and several well-decayed boards—remnants of a long-gone vegetable garden.

The plastic and the boards came out easily, and I raked most of the pebbles and mulch along the asphalt and garage foundation. Climatic conditions and the asphalt presented greater challenges. My biggest concern was coping with the radiating heat along the asphalt. I knew I wanted to grow interesting things in that area, so I listed heat- and drought-tolerant plants that would survive and, better still, thrive in soil loaded with pebbles: sedums, sempervivums, portulaca, miniature irises, junipers, lavender cotton (*Santolina chamaecyparissus*) and others.

I figured the other climate and soil conditions would reveal their suitability as the plants went through the seasons, so I felt I didn't need to spend a lot of time matching plants to the rest of the site. I did want to grow some things I knew would need shade, so those ended up in the rear of the garden or in the shadow of larger plants and the fence. One of the happiest associations was the variegated grouping of polka dot plant (*Hypoestes*

Ray Rogers lives in New Brunswick, New Jersey, and works at Attock Flower Farm, a perennial/topiary/everlastings nursery in nearby Somerset. He has gardened all his life, and worked at the Morris Arboretum of the University of Pennsylvania, the American Horticultural Society and Colonial Park in Somerset.

'Pink Splash'), striped lilyturf (*Liriope* 'Silver Dragon'), and lungwort (*Pulmonaria saccharata* 'Mrs. Moon'). All thrived in the shade of a venerable tree peony, which grew in nearly full sun.

Before designing or installing anything, however, the next step was to evaluate the existing plants. The tree peony was among the few plants which survived the resulting purge. I removed all but one each of the many roses and volunteer phlox, and I eventually eradicated the grasses and thistles. A yew, four herbaceous peonies, a clump of unknown iris, and seedling larkspur and sweet william catchfly (*Silene armeria*) completed the survivors' list. By then the site was cleaned up and ready for on-site planning.

After measuring the basic garden dimensions and drawing a fairly accurate diagram on graph paper, I went to the second floor windows to visualize the locations of the patio, walk, specimen plants and general planting areas. After many mental rearrangements I marked the rough layout with bonemeal. I hoped I hadn't allowed too much space for the patio and walk, thinking about the hundreds of plants I wanted to squeeze into less than 700 square feet. But a voice kept telling me I would want a sizeable patio and walk to accommodate garden visitors as the sweet alyssum and other creepers spread over the bluestone.

Because of time and budget constraints, I did not lay the patio and walk until the following summer. Happily, that presented few problems since I had anticipated the locations of those features as I planted. Only a few plants had to be moved as I juggled the stones into place. However, if I have more time when creating a similar garden, I'll be sure to lay the basic structures before doing any adjacent planting.

From the beginning, three documents guided me as I planned the garden: a plant list, a bulb location map and a journal.

The plant list recorded over 200 plants that first year, and the bulb map prevented unfortunate unearthings during spring and summer as I added, transplanted or removed those 200 plants. The journal included bloom times, ideas for combinations, successes and failures and a bundle of useful information. Taken together, they became an indispensable tool for planning, managing and enjoying my very personal garden.

Five general principles guided me through the first year:

1. Pay close attention to sound horticultural practices.
2. Grow only plants suited to the conditions and "look" of the garden.
3. Plan and plant according to fundamental design principles of color, repetition and scale.
4. Emphasize a good foliage framework, and extend the season with plants of early and late interest.
5. Experiment, expect change and work with the plants.

The soil test, done before anything went into the ground, indicated very slightly alkaline soil high in potassium and phosphorus. Occasional applications of liquid acid fertilizer helped poky and yellowing plants, and virtually everything received a dose of liquified seaweed at planting time. I believe my conservative approach with fertilizer prevented excessively lush growth and fostered good bloom.

A two-inch layer of pine needles, plus the existing bark chips and pebbles, provided an excellent mulch. As the plants grew and filled in, they became their own mulch, conserving moisture and smothering virtually all of the weeds. Although planting at close quarters created a few problems, it basically paid off in quick soil cover and an almost immediate knit-together look.

Choosing the select few for my tiny garden was perhaps the best and the worst

part of the entire creative process. Certain plants were indispensable, including *Artemisia* 'Powis Castle', *Sedum* 'Autumn Joy', and *Juniperus squamata* 'Blue Star'. However, I knew that no matter how well they might grow in other gardens, if they grew poorly in my garden, they would be removed. Why waste effort on inferior plants?

Visitors were often surprised at the variety of plants growing happily together. I decided from the beginning that I wouldn't limit myself exclusively to annuals or perennials or to some other narrow list. With my "only the best" principle as a guide, I enjoyed annuals, perennials, biennials, deciduous and evergreen shrubs, bulbs, herbs, vines and, to my constant pleasure, fragrant flowers and foliage.

It would be futile to grow superior plants with no thought given to sound design principles. Playing with color, like choosing the plants, became a love/hate affair. I wanted to adhere to a basic color scheme, but I would kick myself for excluding plants of "unacceptable" colors. As it turned out, my cool scheme of blue, purple, dark red, magenta, pink, green, gray, white and black accommodated plenty of very satisfactory plants, including a few pale-yellow-flowered *Coreopsis* 'Moonbeam'. They created a beautiful picture, quite cooling on hot days.



Oenothera drummondii

Because of space limitations, I could not repeat the same plants for the sake of unity. Instead, I repeated similar forms and colors. The most pleasing were the gray mounds of *Santolina*, sage, curry plant (*Helichrysum angustifolium*), and lavender providing a foil for bright magenta and red-violet blooms of *Liatris* 'Kobold', *Lythrum* 'Happy', and purple coneflower (*Echinacea purpurea*) 'Magnus', among others.

The judicious use of a few large plants prevented the garden from looking like a collection of 200 dwarfs. So did the patio and walk, whose large mass tied everything together and blended nicely with the many colors and forms.

I paid particular attention to good foliage and to plants with early and late season interest. Besides the evergreens, many herbaceous plants provided important company for the cameo roles of flowers, including *Fritillaria persica*'s dramatic spirals and the threadlike veils of dill and fennel. Crocuses and inch-tall *Sedum acre* provided color in early March; late-flowering lavender *Aster tataricus*, blooming on seven-foot stems, and the diminutive *Sedum sieboldii* with pink flowers and blue leaves stretched the season into November.

Even though my primary goal was to create a finished-looking garden within a year, I planned for further seasons. Resisting the urge to deadhead some annuals insured seeds for next year's plants, and many of the perennials would increase in width and general strength. Some plants would die; others would do too well and would have to be thinned. Unpredictability and constant change in a dynamic garden produce challenges and successes; failures can be recorded and remembered.

During my garden's first year, I enjoyed a parade of hundreds of plants, their qualities and quirks. In one year the weedy patch I adopted had become, with a little planning and effort, a dream realized.



The Top 20 Plants After One Year

Four basic criteria guided me in the selection of these as the cream of the crop: sturdy growth habit, attractive flowers, interesting foliage and pleasing fragrance.

Annuals

Foeniculum vulgare (green fennel). Quickly grows to four feet with yellow umbrella flowers and threadlike anise-scented leaves. Reseeds.

Lobularia maritima cultivars (sweet alyssum). Low, spreading mounds of white ('Snow Crystals') or purple ('Royal Carpet') honey-scented flowers. Easy and long-flowering, and reseeds.

Monarda citriodora (annual bergamot). Impressive three-foot purple spikes and fragrance of Earl Grey tea. Variable growth habit; save seeds of superior forms for next year.

Nicotiana glauca 'Grandiflora' (white flowering tobacco). Open clusters of starry white trumpets emit a haunting fragrance

Top: The walk as seen across the page in July. Yellow *Coreopsis* 'Moonbeam'; purple *alyssum* 'Royal Carpet' on either side. The large head is *Cleome* with *Verbena bonariensis* silhouetted against the gray garage.

on warm evenings. Grows to three feet and responds well to deadheading. Reseeds.

Pelargonium cultivars (scented geraniums). Both slow-growing 'Mabel Gray' (mindful of lemon furniture polish) and spreading 'Gray Lady Plymouth' (rose) dry well for potpourri. Handsome foliage; usually grow under two feet.

Perennials

Alchemilla vulgaris (lady's-mantle). Greenish-yellow flowers seem to last forever above pleated soft green leaves. New foliage in late summer freshens the clump. Never exceeds one foot.

Coreopsis 'Moonbeam'. Spreading slowly but surely, these one-foot mounds of dark green leaves bear pale yellow stars for



Photos by Harry Haskell

Top: Just a few weeks before the photograph opposite the garden displays Phlox 'Dodo Hanbury Forbes', white Nicotiana, yellow Coreopsis 'Moonbeam'. In the foreground are tuberose, lavender, scented geranium 'Gray Lady Plymouth'.

Bottom: A late September photograph shows silver Artemisia 'Powis Castle', red Sedum 'Autumn Joy', and blue Ruta officinalis 'Blue Curl'.



months. Easy, adaptable to some shade and peerless.

Sedum 'Autumn Joy'. Compact mounds of thick leaves support large flower clusters which turn from green to pink to reddish to rust. Irresistible to insects, especially butterflies and honeybees. Grow in lean soil in sun; reaches two feet.

Sedum 'Vera Jameson'. Six-inch open mounds of green/purple/blue leaves and pink flowers open slowly from pinkish buds. Reliable and tough in full sun.

Sedum sieboldii (October daphne; not to be confused with the shrubby genus *Daphne*). Rounded blue scalloped leaves all summer with purplish edges. Pink flowers add color to late-season display. Rarely as tall as six inches, tolerates quite a bit of shade but at the expense of flowers.

Biennials

Dianthus superbus 'Longicalycinus'. Never very robust-looking, it nevertheless produces sizable clusters of pink clove-and-sugar scented fringed flowers for months. About one foot and easy from fresh seed.

Subshrubs

Artemisia 'Powis Castle'. Surprisingly hardy and vigorous, this is the ultimate silver-gray contrast for pink, purple, magenta and blue flowers and leaves. Pungent lacy foliage spreads widely and may reach 30 inches tall. Protect where questionably hardy and cut back drastically in spring—to eight inches or even less—to keep compact.

Chrysanthemum nipponicum (Nippon daisy). Essentially a shrubby, fall-blooming Shasta daisy up to 30 inches. Shiny dark green leaves show white flowers to perfection in October. Hardy; prune to six inches or so in spring.

Helichrysum angustifolium (curry plant; inedible). Dead ringer for scent of commercial curry powder. Fine-textured gray leafy mounds to two feet; pull off yellow flower buds for compact plant. Grow in

well-drained soil and cover thickly in severe winters.

Juniperus squamata 'Blue Star'. Slow growing, low (to one foot after several years), bright gray-blue foil for pink-flowered neighbors. Needs full sun and good drainage for best growth. Very hardy.

Ruta graveolens (rue). Common rue is a grayish green, sharply scented shrublet to two feet. 'Blue Curl' is shorter, slower, quite blue and may be slow to establish. Cut back hard in spring for compact form and fewer flowers.

Rosmarinus officinalis 'Prostratus' (prostrate or weeping rosemary). Ideal for containers; water heavily in hot weather. Pine-scented needlelike leaves are useful for cooking. Profuse light blue flowers appear if grown in full sun. Bring into cool sunny spot for winter and reduce water. Variable height and twisted growth.

Salvia officinalis (sage). Faintly musty scent makes a welcome contrast to sweet and spicy fragrances. Grow in lean, well-drained soil in full sun; cut back in spring. Tends to flop as it tries to reach two feet. Protect lightly in winter.

Santolina chamaecyparissus (lavender cotton). Silver-gray tiny leaves on 12-inch buns. Sun and lean soil encourage tight growth; cut back hard in spring. Odd musky scent.

Santolina virens (green santolina). Larger, green version of the above. Same scent and culture. Both may flop open in spite of your best efforts; the green fills in faster than the silver to produce a low green pancake. ☺



Ocimum (basil)

Pass-along Gardens

Felder Rushing

Pass-alongs. They're there, in every community, every rural route and neighborhood, quietly being slipped from hand to hand, garden to garden. Each has a unique value begging to be shared among gardeners, giving it a special place in the world of cultivated plants. True, many of these heirlooms are "old fashioned," and possess unique beauty, fragrance, hardiness, tolerance of many sites and soils, herbal uses or other strong points. Yet what makes plants "pass-alongs" is the ease and regularity with which they can be propagated and given away. It is said that such plants afford our only opportunity to divide and multiply at the same time.

Some have been preserved and cherished for many generations. Others may be new to the horticultural scene, or recently revived in either original or improved form and therefore new to an area. Still others are so easily grown—or so invasive—that their best uses are for encouraging new gardeners in a sort of "confidence building" scheme.

Since it's impossible to give or receive

plants without at least a word of cultural advice, each one comes with an experience, a tip, often a story. Bonds are developed between those gardeners who share their plants, and special feelings grow between each gardener and his landscape. In turn, these attitudes invite more sharing.

By the way, there's a superstitious Southern tradition, surprisingly common, which holds that if you thank someone for a plant it won't grow. Upon hearing this from a grateful recipient, it follows that the proper response is to simply say, "That's right, honey," and let it go.

Another quality, if you'd call it that, of pass-alongs is their relative scarcity in the commercial marketplace. They are rarely found in the trendy "one stop shopping centers" which seem to be the new norm. In bygone days, a few unusual plants could be found at family-owned nurseries that grew their own stock and sold freshly-dug plants. Itinerant, seasonal peddlers brought herbs, seed and cuttings.

The past decade has seen an encouraging increase in small, specialty nurseries devoted to finding and promoting old or hardy perennials and shrubs. Mail-order firms, old and new alike, have always done a good job of making available unusual plants. Many a gardener has "gone in" with another on a mail order, intending to swap cuttings or divisions the next year.

Felder Rushing is an award-winning author, garden columnist and longtime host of a live radio program and TV program. He travels extensively in Southern gardens, gives lectures on native plants and is co-author of a book on Southern pass-along plants with fellow gardener and writer Steve Bender.

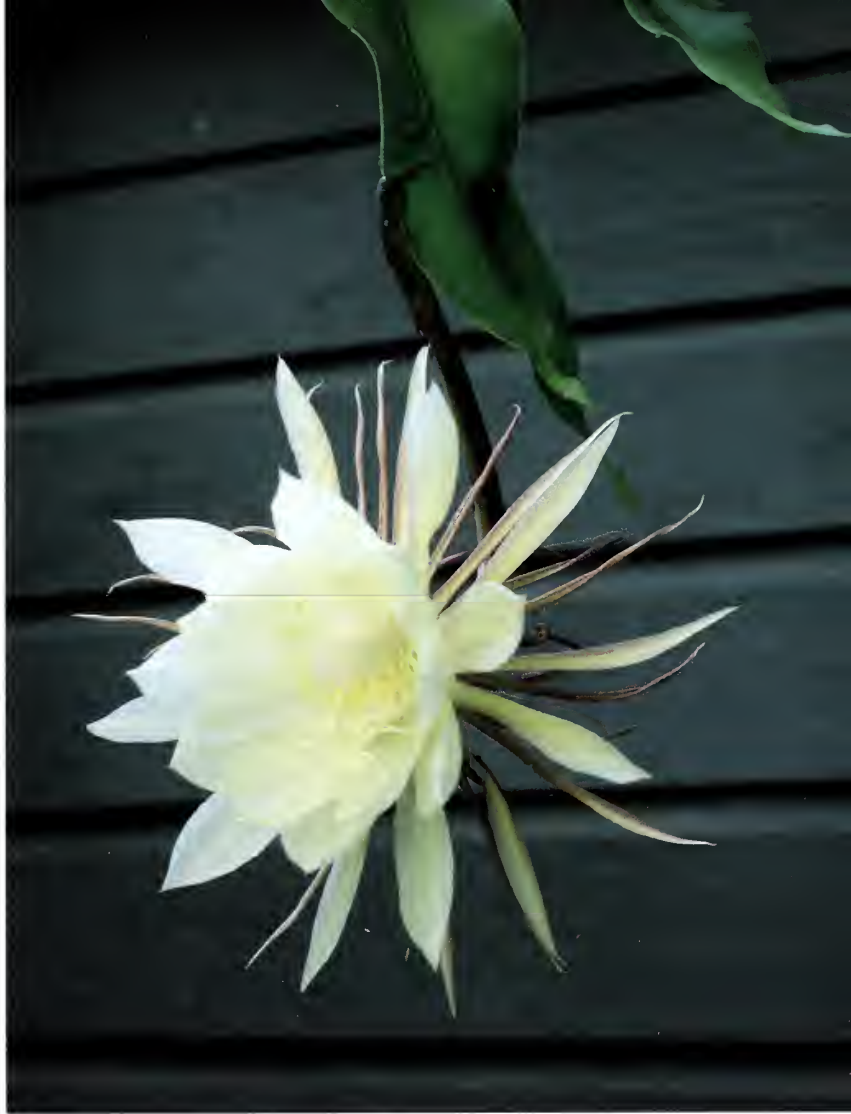


Crinum, milk-and-wine, appears in almost every neighborhood or country garden in the South.



Elizabeth Lawrence's *Gardening for Love* (Duke University Press, 1987) provides pass-along gardeners with a major reference on old plants and their "sweet country names," as well as a fascinating peek into garden souls and cottage gardens of the South and Southeast. Hundreds of plants are mentioned, and there are also lists of mail order sources and addresses of market bulletins through which these cherished plants may be located.

A classic pass-along plant is Dioscorea bulbifera, commonly known as "tater vine." The airborne tubers must be harvested before the first frost, stored over winter indoors and replanted each spring.



Night-blooming cereus, Hylocereus, is an exotic looking pot plant that is a common pass-along.

One of the best places to find pass-along plants (and their gardeners) is at county or state flower shows. Put on by garden clubs, plant societies and extension homemaker clubs, these shows are ideal settings for pass-along gardeners to meet and swap.

Many of these plants are experiencing a revival and becoming central to our exciting new national gardening style, of which cottage gardening is an important part. Seminars are bringing attention to designers, gardeners and writers whose work has highlighted the variety and practicality of hardy plants, especially perennials, annuals and their woody companions. Several beautifully illustrated books are now available, including William Welch's *Perennial Garden Color* (Taylor Publishing, 1989), Madalene Hill's *Southern Herb Growing* (Shearer Publishing, 1987), Neil Odenwald's *Southern Plants*

(Claitor's Publishing, 1987) and Katherine Whiteside's *Antique Flowers* (Random House, 1989). These books, along with an almost constant barrage of related magazine articles, provide both inspiration and information.

In 1989, the Deep South region of the National Council of State Garden Clubs sponsored a two-year project called "Grandmother's Garden," in which old plants have been identified and are being promoted throughout the region.

But the pass-along concept does not represent a mere walk down nostalgia lane; it embraces an active garden style in which propagation skills are more important than scientific plant names. Some gardeners don't even care what the names are, much less about reading or attending educational seminars. Steve Bender, associate garden editor at *Southern Living Magazine*, claims that the experience involved is "so spiritually rewarding that it engenders a sort of botanical evangelism in its participants."

A classic pass-along plant is *Dioscorea bulbifera*, an oddity known widely as "air potato" or "'tater vine." Though this tropical member of the yam family is rarely, if ever, sold, it is commonly seen climbing porch rails, fences and arbors throughout the South. A very tender perennial in most of the region, the plant has airborne tubers which must be harvested at first frost, stored over winter indoors and replanted each spring. In short, it requires a modicum of cultivation. Still, it has found its home, by way of shared tubers, across the region in gardens both urban and rural, and across all economic and racial lines.

This is typical of pass-along plants. Though dozens of very common examples may easily be described by any seasoned gardener, I have agonized over paring the following list to a relative handful. They are found in cottage gardens throughout the South, where they are swapped rather

than bought (gardeners get their start from other gardeners, who got it from others, who. . .).

Flowering shrubs, woody vines and trees are usually passed along as hardwood cuttings, rooted stems or clump divisions. Favorite woody pass-alongs include butterfly bush (*Buddleia davidii*), rose-of-sharon (*Hibiscus syriacus*), yellow rose of Texas (*Kerria japonica*), glory-bower (*Clerodendrum trichotomum*), hardy orange (*Poncirus trifoliata*), mock-orange (*Philadelphus coronarius*), green rose (*Rosa chinensis* 'Viridiflora'), catalpa (*Catalpa bignonioides*) and lilac chaste tree (*Vitex agnus-castus*).

Cottage garden annuals are usually prolific self-seeders and easily collected. No garden could be complete without two or three of the following: spider flower (*Cleome*), globe amaranth (also one of the several so-called "bachelor buttons," *Gomphrena*), old maid (*Zinnia*), jewels-of-Opar (*Talinum*), balsam or touch-me-not (*Impatiens balsamina*), opium poppy (*Papaver somniferum*), johnny-jump-ups (*Viola tricolor*), cockscomb (*Celosia*), wild petunia (*Ruellia*), petunia species, dill and larkspur (*Consolida ambigua*).

In addition to African violets and ferns, some of the most common pass-alongs are tender tropical plants grown in containers. These often must tolerate extremes of low light, low humidity and neglect indoors much of the year (some are hardy outside in protected areas). Though seeds are often shared, most tender tropicals are divided or cuttings are rooted, sometimes in water. Widely grown pot plants include mother-in-law's tongue (*Sansevieria*), burn plant (*Aloe*), cane or wandering Jew (*Tradescantia*), purple heart (*Zebrinus*), *Setcreasea*, walking iris (*Neomarica*), night-blooming cereus (*Hylocereus*), and devil's-backbone (*Pedilanthus tithymaloides*).

The perennial border yields by far the greatest variety of pass-along plants. Most non-horticulturists take the easy route and

lump together all herbaceous perennials into one genre—herbs, bulbs, lilies, rhizomes, ferns, mallows, ornamental grasses and other “soft” perennials. These are treated much the same, and rightfully so, when it comes to propagation, which is most often done by division, or by cuttings.

Paring down to manageable size any accounting of the many pass-along perennials and bulbs can be heartbreaking, especially considering the wonderful resurgence of interest in tough native perennials. Everywhere one looks, in field or under cultivation, are black-eyed susan and other coneflowers (*Rudbeckia* and *Echinacea*), false dragonhead or “obedience” (*Physostegia*), monarda and other beebalms, Southern shield fern (*Thelypteris*), prickly pear (*Opuntia*), yucca and scores of others.

As for imported “exotics,” it is nearly impossible to pass through a neighborhood or by a country garden in the South without noticing milk-and-lily (*Crinum*), bouncing bet or soapwort (*Saponaria*), butterfly or ginger lily (*Hedychium*), many species of phlox and sedum, canna, four

o’clocks (*Mirabilis*), confederate rose (*Hibiscus mutabilis*) and other mallows.

In every other garden is a naked lady (*Lycoris squamigera*), lots of spider lilies (*L. radiata*), montbretia (*Crocsmia*), yarrow (*Achillea*), wood sorrel (*Oxalis*), Peruvian or parrot lily (*Alstroemeria*), upright elephant ears (*Alocasia*), daylily (*Hemerocallis*), summer snowflake (*Leucojum*), jacob’s ladder (*Gladiolus byzantinus*), hidden lily (*Curcuma*), narcissus, turk’s-cap (*Malvaviscus*), firecracker vine (*Manettia*) and red amaryllis.

No pass-along garden list would be complete without horsetail (*Equisetum*), giant reed or cane (*Arundo donax* ‘Variegata’), or such herbs as mint, lamb’s-ear (*Stachys*) and the artemisias.

These treasures are more than historical footnotes in revival. They are the gleanings of the garden, bringing with them smiles, tips and basic contact between people exchanging a special garden love. Fellow garden explorer Gail Barton succinctly summed up pass-alongs when she shared a little bit of tact with me: “The best way to thank someone for a plant is to share it with someone else.”



Papaver orientale

Antique Bulbs for Cottage Gardens

Scott G. Kunst

*The madonna lily, *Lilium candidum*, appears in Minoan frescoes from about 1600 B. C. It was valued for its beauty, fragrance and medicinal virtues. The waxy white blossoms are striking in the June garden.*



Part of the appeal of cottage gardens is their old-fashioned charm, and most cottage gardens include old-fashioned plants. Though herbs and old roses may be most common, there are plenty of others—primroses, bleeding-heart, sweet william, forget-me-not. To add to the old-fashioned ambience of your cottage garden, consider antique bulbs. Generally colorful, easy to care for and fragrant, they have been grown and loved by generations of cottage gardeners. Though many have vanished, the almost three dozen survivors described here are still commercially available.

The so-called minor bulbs have played a major role in cottage gardens for centuries. Snowdrops (*Galanthus nivalis*, introduced into gardens by 1597) are usually the first flowers of spring. Their nodding white bells smell faintly of honey, a great treat in March. For early, pure blue, nothing can compare with Siberian squill (*Scilla sibirica*). Though a relative newcomer to gardens (it first became popular in Victorian times), squill is often found naturalized in old gardens. So is the gloriously fragrant lily-of-the-valley (*Convallaria majalis*). A shade-loving British native, it was being enjoyed in gardens by the 1500s or earlier.

Landscape historian Scott G. Kunst gardens in Ann Arbor, Michigan. He researches and consults on landscape preservation, teaches courses in American landscape history at Eastern Michigan University and writes frequently for the Old-House Journal.

Though species or "snow crocus" are increasingly popular today, the large Dutch hybrids have always been more common. 'Mammoth Yellow', for example, has been a fixture in gardens since before 1665. Its purple and white cousins entered European gardens at roughly the same time, though the oldest available cultivars are 'Purpureus Grandiflorus' (a warm purple from about 1870) and 'King of the Striped' (1880). One species crocus that was common in older gardens is *Crocus susianus* or 'Cloth of Gold' (by 1587, also known as *C. angustifolius*). In bloom it covers the ground with short, dense masses of bright gold flowers.

Tulips have been garden favorites since their introduction from Constantinople in the 1550s, and several historic cultivars can still be found. 'Keizerskroon' (1750) is a stocky plant with deep gold and wine-red blooms. 'Couleur Cardinal' (1815) is a rich red, shaded with plum. The scarlet 'Prince of Austria' (1860) is highly scented, while the rosy purple of 'Van der Neer' (1860) makes it a favorite of mine.

Top: Tiger lilies were the first Oriental lilies to reach the West. It is a true lily with sturdy three- to five-foot stalks that carry dozens of pendulous, turk's cap flowers.

Bottom: Once exceedingly popular, the graceful *Campanelle* daffodil, *N. x odoratus*, is bright yellow, short cupped and fragrant.



Unfortunately, none of the old "broken" or streaked tulips—once the most prized—are commercially available today. To substitute, try the modern 'Cordell Hull', 'Sorbet' or the so-called Rembrandts.

Perhaps closest to the original Turkish garden tulips is the pale yellow and red *Tulipa marjolettii*. Though still classified as a species, it is apparently a very old garden variety that escaped and naturalized in Italy where it was rediscovered—along with other "neo-tulips"—in the 1800s.

Other true species tulips have long been grown by discriminating gardeners. The dainty, red-and-white striped *T. clusiana* (by 1636), for example, and the nodding, yellow *T. sylvestris* (formerly *T. florentina*, by 1629) were both grown by Thomas Jefferson at Monticello.



Though sometimes considered stiff and formal, hyacinths deserve a place in the cottage garden because of their long history (which parallels that of the tulip) and powerful fragrance. Several cultivars common today date back to the hyacinth's Victorian heyday, including 'L'Innocence' (white, 1863), 'Lady Derby' (pink, 1875), and 'City of Haarlem' (pale yellow, 1893). Looking more antique with their small spikes and unusual colors are 'Distinction', a deep maroon from 1880, and 'Oranje Boven', a salmon-pink from 1870. Two old double hyacinths are the lavender 'General Kohler' (about 1878) and 'Chestnut Flower' (1880) with narrow, loosely set spikes of starry pink florets. All are fragrant.

Another Turkish contribution to our cottage gardens is the exotic-looking crown imperial (*Fritillaria imperialis*, 1576). In spring its three-foot stalks are topped by a crown of red, orange, or yellow bells with a tuft of green leaves above them. Though some gardeners are put off by its smell—reminiscent of a skunk—for others this only adds to its freakish charm. To keep crown imperial from disappearing, try planting it on its side in a bucketful of pure sand in a spot that never gets too wet or icy.

Though daffodils came into their golden age in the early 20th century, several varieties had been well-loved for centuries before that. *Narcissus x medioluteus* (formerly *N. x biflorus*, by 1629) is common in old gardens in the mid-Atlantic and southern states. Known by many names—'Primrose Peerless', 'Twin Sisters', 'Cemetery Ladies'—it flowers late in the season with two fragrant, white-petaled, yellow-cupped blooms per stem.

Another late, fragrant, historic daffodil is the 'Old Pheasant's Eye' (early 1800s, *N. poeticus recurvus*) with clean white petals and a small red-rimmed cup. Much harder than 'Primrose Peerless', it is also found in a beautiful double form well described as gardenia flowered.

Once exceedingly popular, the graceful old 'Campenelle' daffodil (by 1601, *N. x odoratus*) is bright yellow, short cupped and fragrant. Though perhaps best in USDA Zone 6 or warmer areas, it blooms in my Zone 5 garden. Its starlike double form, unfortunately, does not.

For trumpet daffodils, try the British lent lily (by 1581, *N. pseudonarcissus*). There are many subspecies, some of which look like a down-sized version of the classic 'King Alfred'. Similar in form is 'W. P. Milner' (1884), a miniature daffodil with creamy white petals and delicate yellow trumpet.

For summer bloom in the cottage garden, consider lilies, some of which are among the oldest of garden flowers. The madonna lily, *Lilium candidum*, appears in Minoan frescoes from about 1600 B.C. Valued by Roman and medieval gardeners for its beauty, fragrance and medicinal virtues, it was grown by the Pilgrims in their first New World gardens. Madonna lily's waxy white blossoms are striking in the June garden, but even better is its intoxicating fragrance.

Tiger lilies were the first Oriental lilies to reach the West, arriving in 1804. Not to be confused with the orange daylily, *Lilium tigrinum* is a true lily with sturdy three- to five-foot stalks that carry dozens of pendulous, turk's-cap flowers of a strong, odd orange. In old gardens, tiger lily often blooms alongside magenta phlox, artlessly clashing in true cottage-garden fashion. Though reputedly prone to virus infection (as is the madonna lily), in most gardens the tiger lily grows vigorously.

The list of antique bulbs goes on and on: martagon and other lilies, naked ladies (*Lycoris*), tuberose, other daffodils, an array of grape hyacinths, nodding star-of-Bethlehem and so on. In the flowery profusion of your cottage garden, may you always find room for one more. 🌸

The Cottage Gardens of Texas

Dr. William C. Welch

The typical Texas cottage garden was a small front dooryard, enclosed by fence or hedge. A walk—usually packed dirt, brick or stone—led to the front steps. In this small area, the gardener planted every sort of flowering greenery. The object was to have as great a display of bloom as the season allowed. This garden was hoed to keep down weeds during the growing season, and “inspired” by shovelful of cow barn and chicken coop manure in the winter. The backyard was often separately enclosed, and in common with most of the lower South, was “swept” with a “besom” (a broom of twigs), usually by a child of the family. Often this was done because chickens were allowed to forage in the back yard. This gardening tradition was followed largely by rural working class folk, both white and black. Mexican-Texans were also renowned for their flowering door-yards, and their aim was also to produce

the most colorful display possible. Northern European immigrants to Texas, especially the German influx of the 1840s and '50s, also had dooryard gardening traditions.

The cottage garden in Texas had its beginnings in the Spanish *presidios* of the 17th and 18th centuries, though no records describe them. A later visitor to San Antonio did document the *labores* or small farms that lined the San Antonio River in 1843, recalling the flowers, orchards and vegetables intermixed in these plots. The Church, here as in Europe during the Dark Ages, preserved and introduced plants, especially flowers, to decorate the altars during church festivals.

Mrs. Mary Austin Holley, cousin of Texas' first Anglo colonizer Stephen F. Austin, wrote an immigrant guide to the new Mexican state (1821-1836). In her diary, she sketched some of the early homes built in the coastal section. The house of her brother, Henry Austin, near Brazoria on the Brazos River was one subject of her pencil in 1835. She showed the huge 'Old Blush' rose bushes lining the walk and the multiflora roses running over "a good fence . . . to form a hedge." She also mentioned the 'Old Blush' planted in the family burial plot with figs placed outside the fence.

Dr. William C. Welch is Extension Landscape Horticulturist for the Texas A & M University system and lives in College Station, Texas. He currently serves as Landscape Design Chairman for the National Council of State Garden Clubs and recently completed a book on perennials and old garden roses entitled Perennial Garden Color, published by Taylor Publishing Company, Dallas, Texas.

Emily West de Zavala, second wife of the Texas patriot, planted her garden at Lynchburg (near present Houston) as events sparked the Texas Revolution. Her granddaughter recalled how this garden was arranged and what plants it included, for in later years, when the widowed Emily remarried and moved to Galveston, she moved her plants and arranged them in the same way. Her Classical Revival East Texas house had the climbing form of the rose 'Cramoisi Superieur' on the west corner of the porch and the yellow 'Lady Banksia' on the east. A large magnolia anchored the west front corner of the picket-fenced dooryard, and an old cape jasmine graced the east corner. In between was a graduated border with the beds lined in violas, pansies, forget-me-nots and johnny-jump-ups. The middle of these beds had pinks, verbenas, geraniums, larkspur, pink Texas Stars and lady's slipper. (Some of these were native to the area and probably collected nearby.) Moss and tea roses were planted along the fence. Irises

Top: *This south central garden contains Texas bluebonnets, annual phlox, old garden roses and herbs.*

Bottom right: *Gladiolus byzantinus was found in an east Texas cemetery where it had grown undisturbed for many years increasing over that period of time.*

This re-creation of a turn of the century Texas garden contains old roses, perennials and annuals. There are very few authentic cottage gardens still extant in rural Texas, but plants may be found in old cemeteries and house sites.





Photos by author



were planted in the west side yard followed by herbs mixed with cockscomb, bachelor-buttons, "old maids" (unimproved kinds of zinnias), hollyhocks, marigolds and touch-me-nots. A trellis shading a garden seat was covered in roses. A specimen sour orange tree grew in the back yard, and cabbage roses lined the rear walk. A lone double-flowered pink althea stood guard by the front gate.

Of the plants in this early Texas garden, the annuals probably were purchased originally as seed, and then would have reseeded yearly. The forms of zinnias, cockscombs and marigolds would not have been the impressive sorts currently available—the product of quite recent 20th century hybridizers — but rather some near-species types. Some of the roses were received as parting gifts when de Zavala retired as Mexico's minister to France in 1835. These were evidently the latest products of the French breeders and as yet unknown in the New World. In her Galveston garden, Emily later grew a fine collection of roses including 'Marechal Niel', 'Catherine Mermet', 'Ducher', 'Paul Neyron', 'La France' and 'Salet'.

German immigration had a tremendous impact on Texas during the 1840s and 50s. One 1845 observer wrote that the gardens of the "older cities"—such as Galveston, Houston, and San Antonio—contained chinaberry trees (*Melia azedarach*), oleanders, crape-myrtles, altheas, retama trees (*Parkinsonia aculeata*), Texas mountain laurel (*Sophora secundiflora*), catalpas, locust trees, climbing 'Cherokee' roses and many other trees and shrubs "grown in Central Europe only in hothouses."

Of these flowering shrubs the crape-myrtle had been imported from India to Europe by 1750 and had reached America by the early 19th century. The chinaberry had been grown by Thomas Jefferson at Monticello in 1776, coming from its native Asia via England in 1656. The althea was

also a Tudor introduction grown at Monticello. The 'Cherokee' rose (*Rosa laevigata*), though often considered a native, was probably imported from China into the Southern colonies, where it naturalized. Oleanders had only made their advent at Galveston a few years before, brought by a ship captain from the Caribbean to his gardening sister. Because it rooted so readily from cuttings, oleanders were already plentiful in the city by 1845.

After the Texas Republic period (1836-1846) and with the security of statehood (attained in 1846), the settlers gradually were able to concentrate on the comforts of life. They ordered seed and plants from New Orleans and the Northern states. Most local general merchandise stores in the larger towns carried flower and garden seeds by David Landreth and Co. of Philadelphia, Grant Thorburn of New York or other early companies. By the mid 1850s, nurseries were founded in New Braunfels, Victoria, Benham and Austin.

Other plant "heirlooms" were brought by settlers from their homes in other states and countries. These were often treasured reminders of home and an easier life in more settled areas. As today, neighbors and friends shared favorite plants and so increased their numbers.

Even from the earliest times, educated Texans realized the land was a treasure trove of glorious wildflowers. Emily de Zavala transplanted or seeded these into her Lynchburg garden, and perhaps others did as well.

German-born Dr. Ferdinand Jakob Lindheimer came to Texas in 1836 and was later a botanical collector. Dr. Asa Gray at Harvard and Dr. George Engelmann at St. Louis, both botanists, were two of Lindheimer's clients. He collected on the Texas Coast and in the Hill Country, and wrote to popularize the best of his finds. In 1848, he told a friend that "... the flora of this country offers so much that is beautiful and that the transplanting of these indi-

genes into gardens and flower pots is becoming more general and promises to become fashionable." Some among those he recommended were *Passiflora*, *Asclepias*, dark double violet clematis, *Echinacea*, *Lisianthus*, *Mirabilis*, lupines, asters and *Eryngium*.

There are very few "authentic" cottage gardens still extant in the rural areas of Texas, but occasionally old house sites, cemeteries and old towns will have plants surviving from these sorts of plantings. Spring-flowering bulbs in particular are often seen. Texas has very specific bulbs which will survive and colonize here; the most obvious are the tazetta narcissus (often called "jonquils" or "paperwhites"), *Lycoris*, hardy gladiolus, *Amaryllis*, *Crinum* and grape hyacinths. These mark old beds in long forgotten dooryards and their heavy fragrances recall earlier springs.

Modern collectors have found and made available through commercial sources many of the old roses. The towns of Weimar, Brenham, Navasota, Anderson, the older residential sections of Bryan, Paige, Bastrop, San Marcos, East Columbia, Frelsburg, San Antonio, Shelby, Castroville, New Braunfels and Victoria are noted for their old shrub roses. Many teas and chinas and some early polyanthas, noisettes, bourbons, ramblers and gallicas are the classes that generally survive summer heat in this area. One lovely cream-colored tea has been found in Laredo on the Rio Grande—a tribute to its summer hardiness!

Of other perennials, several irises survive here. The most common is *Iris x albicans*, the old white flag, which is often planted in cemeteries. A lavender form also exists. Louisiana irises may be found on the coast and in East Texas. Native hibiscus, known as "marshmallows," are abundant in low areas of East Texas. All mallows act as perennials in the southern half of the state and were often planted. Wild violets and

wild ageratum favor damp places and were often used in gardens. Wormwood (*Artemisia*), bouncing bet (*Saponaria*) and yarrow (*Achillea*) were also perennial favorites.

Mexican petunia (*Ruellia*) is native to Mexico and has naturalized in much of Texas. Petunialike blue-purple flowers appear on tall stems from spring through fall, even in the hottest, driest weather. *Justicia* is often seen in San Antonio along with the bird-of-paradise shrub (*Caesalpinia gilliesii*), castor beans, Barbados cherry (*Malpighia glabra* x *M. puniceifolia*), spineless forms of *Opuntia* and ghost plant (*Graptopetalum paraguayense*).

Small trees often found in cottage gardens include pomegranate, native plums, figs, mulberries (for the chickens), persimmon and chinaberry. Large trees were generally avoided as they gave too much shade for the flowers.

Vines were used to shade the porches and patios of Texans and many were multi-purpose kinds. Queen's crown, all sorts of grapes, cypress vine (*Ipomoea quamoclit*), scarlet runner beans, morning-glories, balloon vine (*Cardiospermum halicacabum*) and passionflower are among the most commonly mentioned. Madeira vine (*Anredera cordifolia*), a fragrant, tender climber with greenish-white panicles, was much used in Victorian days as well.

These surviving plants and sparse writings of early travelers and immigrants are the meager sources of information on old Texas cottage gardens. Newspaper ads and nursery catalogs of the period also provide clues about what was grown. This information is important not only for historical interest, but also because the present need to conserve water in Texas makes the summer-tough yet generously flowering plants used in old cottage gardens very precious. In their cottage gardens our ancestors completed a very comprehensive plant testing program—one that lasted 150 years! ♣

A Cottage Garden *New Mexico Style*

Ellen Reed

A New Englander transplanted to a semidesert, I chose this home 21 years ago because of its lush backyard set off from its neighbors by high evergreen shrubs and shaded by 20-year-old trees. The front yard was a steeply sloping bluegrass and bermuda grass lawn

with large evergreen foundation plantings, a weeping willow astride the sewer line, a four-headed blue spruce and a mildew-prone lilac. The backyard also included sun-starved floribunda and hybrid tea roses, eight huge arborvitaes, several large junipers, photinias, *Euonymus japonica*, a

Ellen Reed grew up in Maine, where she learned gardening from her grandmother. Since then she has lived and gardened in Germany, Japan and—for the last 20 years—in Albuquerque, New Mexico.

In the back garden the fence provides a backdrop for summerblooming impatiens and Catharanthus roseus.





The front garden slopes steeply down to the street. In spring narcissus, 'Red Jade' crabapple and Spirea thunbergii provide the accents in this area.

honey locust, two mountain cottonwoods and a lovely 'Kwanzan' cherry.

The 100 foot by 170 foot lot is divided by a long, low, white house into a 40-foot deep steeply sloping, eastern-facing front yard and a 60-foot deep flat backyard with a small hourglass-shaped pond and waterfall to the south. There is a curved, cement, 30 foot by 15 foot patio along the back of the house. The honey locust was in a mid-lawn island.

We are in an established neighborhood in Albuquerque, New Mexico. Average annual precipitation of seven to ten inches occurs mostly in July with some rapidly melting snow between November and April. There is a 20 to 30 degree daily temperature fluctuation, so the ground usually thaws during sunny winter days. Our 100-degree days may occur for a week in June and lows in the teens come in January or February. May 15 to October 15

are our frost-free dates and high winds are expected in April. We are classified as high desert, USDA Zone 6. Humidity generally is 10 to 30 percent. In order to grow other than dryland plants, it is necessary to irrigate once or twice a month in winter and two or three times a week during the growing season.

Bluegrass and bermuda grass lawns and evergreen foundation plantings are the norm in established neighborhoods, with Southwest landscapes of juniper, pinyon pine and yucca in a sea of gravel prevailing in newer developments. Purple-leaf plum and 'Hopa' crabs are the most common ornamental trees with orange pyracantha, pampas grass, Spanish broom and various cotoneasters frequent accents. *Ulmus pumila* (Siberian elm) and honey locust are common shade trees in older areas and fruitless mulberries or London plane trees in newer ones.

The most memorable part of my garden used to be the secluded backyard but is now the inviting front garden with its winding welcoming path leading through ever-changing colors and forms. This is due in part to natural catastrophes, to happenstance and to some recent planning. The blue spruce blew over, a cottonwood died of borers and large photinias and euonymus shrubs froze in a record -17 F degrees in 1971. The weeping willow was removed when Roto-Rooter had to come for the second time. I missed it for about a week until I realized its sunny spot could be filled with flowering shrubs and perennials. The lawns retreated by a shovel's width per year as I collected more interesting plants. Even with my limited design training I realized the chaos which could develop from my passion for one of everything. The white house with its red door set my original patriotic color scheme, which has broadened to include all but the flaming purples and magentas. I have added trees and shrubs with mostly red or white flowers. Pesky plants have been eliminated and replaced by ones with several seasons' beauty or off-season interest.

After exhausting local nurseries I succumbed to the lure of the photographs and descriptions in mail-order catalogs. I discovered the reliable ones and how to check flamboyant prose with a garden encyclopedia. If it says "needs constant moisture" or "hates lime," it's not for Albuquerque. Also, many dryland natives will not tolerate supplemental watering or less than full sun. However, my semi-shade is enough for many Eastern sun lovers. The eastern slope of my front garden protects heaths (*Erica* cultivars) from the burning afternoon sun and provides the rapid drainage preferred by many bulbs and perennials.

A microclimate under an arching juniper by the front entrance allows me to grow three low azaleas, *Bletilla striata*

(Chinese ground orchid) and *Athyrium goeringianum* 'Pictum' (Japanese painted fern). There, also, the spotted leaves of *Zantedeschia albomaculata* (hardy calla lily) are replaced in the fall by the white-veined arrowheads (*Arum italicum*). *Mimulus* hybrids have become established along with volunteer 'Cambridge Blue' lobelias at the juniper drip line.

My love affair with bulbs began when I was a child and read *The Secret Garden* by Frances Hodgson Burnett. Many of the minor bulbs became too prolific and had to be eliminated from the central raised rockery which I designed to camouflage the honey-locust stump. *Tulipa clusiana* and *T. chrysantha* are still established here and their invasive foliage smothers less hardy neighbors such as dwarf narcissi. Other less aggressive species tulips enjoy the drainage provided by additional volcanic scoria and pumice in the rockery. Several saxifrages, hebes, penstemons, sedums and *Androsace* (rock jasmine) have spread their roots in the cooler areas under the rocky ledge. On the east end of this raised area several dwarf heaths (*Erica* spp.), *Papaver burseri* (alpine poppy), *Geranium sessiliflorum* 'Nigrum' and *Chrysanthemum ptarmiciflorum* have woven themselves together very satisfactorily. Numerous snowdrops (*Galanthus* spp.), species crocus, hybrid cyclamens and dwarf narcissus add early interest. *Anemone sylvestris* is proving too well adapted here and will have to be restrained. A large *Ilex aquifolium* 'San Gabriel' has developed well since the locust tree's removal and provides height to this central bed. Under the holly, leaves of *Cyclamen hederifolium* provide a beautiful winter ground cover after its dainty flowers are past. Bordering this island at lawn level are *Campanula elatines* *garganica*, *Ajuga reptans* 'Burgundy Lace', *Viola cornuta* 'Blue Perfection' and *Geranium dalmaticum*.

The design of the garden became more pronounced after the children (my lawn

mowers) left home and I smoothed out some of the sharpest curves of the back flower beds and eliminated the nooks of lawn by setting stepping stones in a mix of creeping veronics and thymes. The steep, cracked, concrete front walk dividing the sloping lawn was replaced with a gradually ascending path bordered by granite boulders from the nearby Sandia Mountain foothills. Several groupings of steps are formed of granite and the walk surface is finely crushed gravel, which has proven a wonderful seed bed. Many seedlings are repotted for sharing, replanting or donating to the Albuquerque Garden Center plant sale.

The front is accented on the northwest with a 'Red Jade' crabapple balanced on the southeast by a group of white-flowered shrubs: *Spiraea thunbergii*, *S. prunifolia*, *Abeliophyllum distichum*, a large treelike cotoneaster (*C. hupehensis*), *Vitex agnus-castus* 'Alba', *Buddleia davidii* 'White Profusion' and a double white lilac. Several weigelas recently added are much appreciated by the hummingbirds.

After unsuccessful attempts to disguise the peeling paint of the back cinderblock wall with ivy and evergreen shrubs, I removed all the ivy, which preferred to creep into the garden anyway, and had a six-foot cedar stake fence constructed as a neutral background on the west and north sides. Now I am surrounded by my neighbors' treetops.

Spring flower display begins with snowdrops, *Hamamelis x intermedia* 'Arnold Promise' (witch hazel), *Adonis amurensis*, *Eranthis* (winter aconite), *Erythronium* cultivars (glacier lilies), species crocus, *Erica* cultivars (heaths), *Helleborus lividus*, *H. foetidus* and *H. orientalis* (lenten rose) and *Anemone pulsatilla* (pasque-flower). Early and late narcissi and hyacinths continue the show. Botanical tulip cultivars (*T. greigii*, *T. kaufmanniana*, *T. fosteriana*), Darwin hybrids and lily-flowered tulips, which were originally planted in groups of

five to 12, have persisted and increased when planted in a cold area on a one-inch layer of perlite and fertilized with superphosphate in fall or early spring. All bulb foliage is foliar fed with a balanced liquid fertilizer after bloom.

Bulb bloom is followed by self-sown blue larkspur, bachelor buttons and Shirley poppies. Forget-me-nots (*Myosotis sylvaticus*) form a sea of blue among the bulb foliage. Shrubs are pruned heavily after bloom to encourage vigor and control size. Early single peonies, *Paeonia tenuifolia* (fern-leaf peony) and tree peonies follow next. I prefer the bloom and summer foliage of Siberian iris to the more commonly grown tall bearded iris, which require more space and sun than I can provide. *Helianthemum* (sun rose), blue flax and *Eryngium maritimum* (sea holly) have proven dependable. *Filipendula vulgaris* (dropwort) was one of my early successes and is the only one of that genus to withstand spider-mite infestation. I find that cutting back foliage as well as spent bloom often rejuvenates perennials and may inspire reflowering.

Summer color is provided by a succession of native and exotic perennials supplemented with *Catharanthus roseus* 'Bright Eye', white and red impatiens and volunteer red and white *Portulaca* (moss rose), sweet alyssum and *Cosmos* 'Diablo'. About a dozen miniature roses bloom in a bed along the front walk.

Late summer brings on self-sown *Salvia coccinea* (seed collected in Texas), Monarch butterfly-attracting annual *Asclepias curassavica* as well as cushion chrysanthemums. *Salvia elegans* is pineapple sage, Japanese anemones, *Lycoris radiata* (spider lilies), *Sternbergia lutea*, *Colchicum autumnale* (autumn crocus) and fall crocus species. Several *Amelanchier* (shadblow or service berries), a staghorn sumac, *Hydrangea quercifolia*, *Ribes aureum* and pear and cherry foliage provide autumn color, as do scattered red leaves on hardy

geraniums, *Mabonia aquifolium*, *Berberis gladiwynensis* 'William Penn' and the spiraeas. I also enjoy the dry foliage or seed pods of Siberian iris, *Sedum spectabile* 'Autumn Joy', *Catananche* (cupid's dart) and hostas. Several crabapples, red pyracantha, dwarf cotoneaster, deciduous euonymus and hollies provide colorful berries until consumed by the birds.

In addition to the ornamental plants, I grow six Burpee 'Whopper' VFN tomatoes in cages in the front yard along with garlic, green beans and a couple of 'Ichiban' eggplants. Butter lettuce and 'Sugar Snap' peas followed by cucumbers grow in the back. Many ornamental and culinary herbs grow around the patio. A grafted pear, sour cherry, black currants and alpine strawberries provide fruit.

Nondiseased plant refuse is recycled in a compost system managed by my husband and the finished compost is used when planting or as topdressing.

My most recent experiment has been to inoculate the cottonwood stump with *Pleurotis ostreatus* (oyster mushroom

spores). I am awaiting my first crop.

Plants with interesting flowers and attractive growth habit appeal to me most. Ones that need excessive pampering don't last long here. Rampant growers get composted with a few potted for the plant sale accompanied with warnings for the unwary. I particularly enjoy hardy miniature bulbs, hardy geraniums, Eastern woodland plants (I grow nine species and cultivars of violets), ericas and plants with interesting foliage. I continue to try new plants whether from cuttings and seeds collected on trips and from friends or mail-order sources. I seldom order more than one of a kind at first as plants can usually be multiplied if they thrive here and there is not room for three of everything anyway.

More attention to native and drought-tolerant plants would cut down on my water use but I feel vindicated whenever strangers stop their cars and enjoy my colorful cottage garden. ☘

Daffodils and pasque-flower blend together in the author's garden. After the bulbs have finished, blue larkspur, bachelor buttons, Shirley poppies and forget-me-nots cover the bulb foliage.



A Western Dryland Cottage Garden

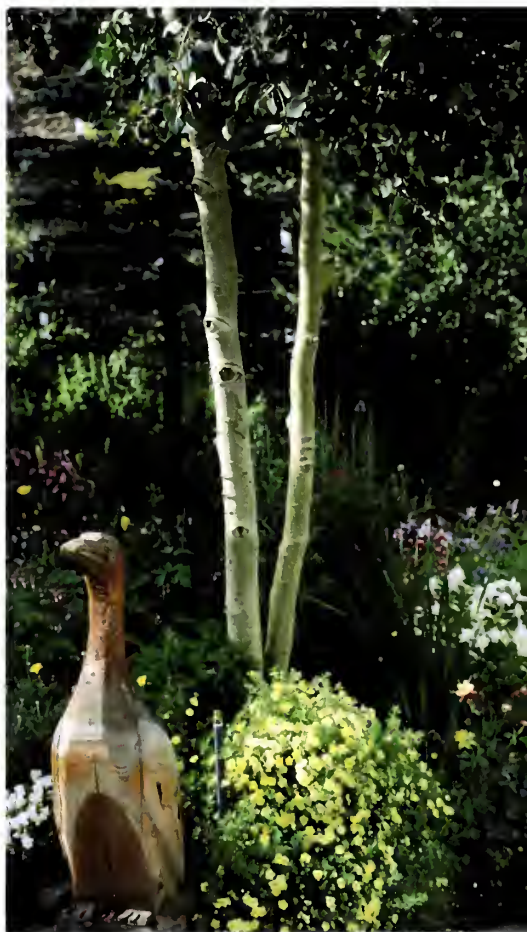
Panayoti Kelaidis

Nothing presents greater obstacles to gardening than drought. Soils can be amended, trees can be planted or cut down. But if it doesn't rain or snow, one must resort to the hose. Gardening in arid and semiarid regions is practically synonymous with watering. In order for gardeners in dry climates to take a vacation, they must first find, then cajole, bribe or beg some indebted family member or unsuspecting neighbor into indenturing themselves to a hose.

Traditionally, cottage gardens are associated with moist, even maritime, climates and most of the plants grown in them need a regular supply of moisture at the roots. Likewise, it's well known that dry regions can be floriferous. In wet years, even deserts boast rich displays of colors. But plants do not have to originate in desert to tolerate periods of drought. There are tens of thousands of ornamental plants that come from the dry steppes of Asia, from South Africa's karroo and the Patagonian pampas, from the Mediterranean maquis and phrygana, not to mention the chaparral, sagebrush and prairies of the American West.

Cottages and their gardens exist all over the world in all sorts of unlikely climates and surroundings. Isn't it theoretically

Panayoti Kelaidis is curator of the Rock Alpine Garden at Denver Botanic Gardens. His special interests are the conservation and cultivation of Western native plants.



Photos by Rob Proctor

This Breckenridge, Colorado garden is described on page 73. The garden is in front of the Bay Street Company and blooms from early April until early September.

possible to combine the right plants in the right way so that even in dry climates one can re-create the floriferousness and ambience of a traditional cottage garden? This is the question Gwen Kelaidis sought to answer in designing a 60-foot border along the northern boundary of her backyard in Denver, Colorado. She had gar-

dened for many years in the rich soil and well-watered summers of Wisconsin, producing a magnificent cottage garden around the shrinking patches of grass at her previous home before moving to sunny, dry Colorado. Denver is lucky to get 15 inches of rain a year, but her new home at least did have a rich clay loam and evidence that previous owners had gardened for most of the last 60 years. Despite a few years of neglect, opium poppies, annual delphiniums and even lilies were in evidence, and old plants continue to resurface years later, like forgotten memories. The long border was dug, and the worst clumps of crabgrass and bluegrass removed before a small amount of compost was spaded in and the first perennials and annuals installed.

Gwen followed the same rather simple design methods practically all cottage gardeners employ in their work: During the growing season, day after day, week after week she would come home from nurseries or plant sales with flats of plants and she would sit in front of her border looking for rapidly vanishing open places to insert her acquisitions. Plants that didn't perform to expectation were summarily moved or removed, and at times the border seemed as restless as a Balkan line dance. She was constrained by the knowledge that new plants would soon be enduring great heat and minimal supplemental irrigation. Like most gardeners, Gwen had strong prejudices and definite notions as to the colors and textures she wanted to have in this border. Although pen never touched graph paper, a complicated, integrated and wholly satisfying garden quickly came into being. Design by trowel and spade has the advantage of immediacy.

What criteria are used for planting in this garden? Obviously the plants must endure full Colorado sun and long periods of drought. As in all cottage gardens, plants are valued for their long season of

bloom, vibrant and compatible colors and their ability to associate closely with neighbors. Blues, lavenders and soft pinks are valued above all other hues—although in the omnipresent, burning Colorado sun pastels need vivid yellows, whites and hot reds to provide a foil. What plants has Gwen selected, and how have they performed?

Traditional Cottage Garden Plants

Although many traditional cottage garden plants will grow in a wet climate, they do not necessarily originate there, nor do they need constant irrigation in order to perform well. Most bulbs (aside from lilies) are adapted to long periods of summer drought, and practically all crocuses, tulips, sternbergias, irises and even narcissus will survive and even thrive in long periods of summer heat and dryness. Tulips and crocuses, in particular, perform much better in dry climates than in wet. Waterlily tulips quickly form large clumps in any sunny, dry garden, and while their flowers may not be as large in subsequent years, they will persist, produce seed and self-sow if they are allowed. The many tiny scarlet tulips sold by Dutch firms as "botanicals" are particularly satisfying in Colorado: *Tulipa linifolia* opens its brassy, scarlet stars for weeks on end in our sunny, cold Aprils. *T. wilsoniana* is usually a bit more cup-shaped, with larger bells of refulgent vermilion that gradually build into magnificent clumps. The many tiny early yellow tulips can even be weedy if allowed to go to seed: *Tulipa tarda* resembles *T. urmiensis* but with pale yellow petals alternating with the brighter colored segments. Both tolerate some shade as well. These and a number of tiny crocuses like the purple violet clones of *Crocus tomasinianus* and the endless variations on *C. chrysanthus* will combine with almost any later blooming perennial, since in a dry border they do not object to being overgrown during the entire growing sea-

son. They do best mingled with plants that can be cut to the ground in fall so that the bulbs can show up unencumbered in the early spring.

Lavender (*Lavandula angustifolia*), lavender cotton (*Santolina chamaecyparissus*), rue (*Ruta graveolens*)—indeed, most garden herbs—thrive with drought. In one long extension of her dry border that Gwen calls the “herb strip,” these follow on the heels of spring bulbs to provide a wonderful, long season of bloom in early summer. The yellows of rue and santolina are a perfect foil for the blues of the lavender. This tremendously successful border culminates its season when Russian sage (*Perovskia*) and butterfly weed (*Asclepias tuberosa*) reach a peak of color in July and August. These are planted throughout the strip and the lavender filigree and yellows of their bloom echo the colors of the earlier herbs. Gwen can’t recall watering this garden more than once or twice a year (if that much), although it may receive a bit of runoff from the roof. It does experience the full blast of south sun, and reflection off the south side of the house and concrete path.

Although technically a shrub, *Caryopteris x clandonensis* is a fine addition to dry borders. Not only does it form a mound of subtle blue for much of the late season, its twiggy shape is decorative in the winter as well.

It’s intriguing that many of the bright red cottage garden plants traditionally used in European cottage gardens are actually North American wildflowers. *Penstemon barbatus* grows much better and lives much longer if it dries out occasionally, and *zauschnerias* do not seem to require supplemental irrigation in Colorado once they are established. A vivid yellow sport of the penstemon, developed by the North Platte experiment station as ‘Schooley’s Yellow’ is very popular in sophisticated Denver gardens. The pineleaf penstemon (*P. pinifolius*) is

another orange-red flowered native of the American Southwest that is popular around the world. In Denver it blooms most of the summer if deadheaded, and the deep green mounds of foliage are attractive at all times of the year—a perfect edging for a dry garden. *Zauschneria californica latifolia* can grow more than three feet tall, and blooms from August to frost with an intensity of orange-red that cannot be duplicated in cooler, wetter climates. Standing cypress, *Ipomopsis rubra*, from Texas is delightful both as a filigree, basal rosette its first year (like a ball of green lace), and the second year when it towers to four or five feet and produces a vivid torch of red trumpets for much of the summer season. Be sure not to deadhead this biennial if you want the performance to be repeated.

The common larkspur of cottage gardens, *Consolida ambigua*, reveals its dry-land ancestry by naturalizing wildly throughout Gwen’s border. She ruthlessly hoes seedlings from late autumn when they begin to germinate right up to the time they bloom, although a number of stalks are permitted to go to seed to repeat the performance next year. Although common in many people’s eyes, the brilliant cobalt blues, whites and powdery pinks of this staunch winter annual give a long season of color for very little effort. *Calendula officinalis* is just as energetic a self-sowing annual, and the large orange-yellow daisies are produced for the entire growing season. These are fine “filler” plants to grow where bulbs die back, or on the fringes of the garden to create a full, cottage look. During moist years, neither requires supplemental moisture.

When one considers how many hundreds of species of *Salvia* are found in both east and west hemispheres, north and south of the equator, it is surprising that so few appear in gardens. *Salvia* contains more promise for dry gardens than almost any other genus. The brilliant selections



Photo by Sandra Snyder

Another photograph of the garden at the Bay Street Company shows the garden at its peak of June bloom. It features columbines, lupines, geraniums, sbasta daisies, iceland poppies and a jungle of traditional garden plants.

and hybrids of European meadow sage (*S. x superba*) such as 'East Friesland' and 'May Night' are among the longest blooming perennials in hot climates. Their velvety blue-purples combine well with blues, yellows and whites and will last three months with judicious deadheading. The clary (*S. sclarea*) of herb gardens looks just as good in a cottage garden, and thrives under almost any cultural or moisture regime in Colorado. A somewhat more compact phase of *Salvia sclarea* introduced from Tadzhikistan has even proven perennial here. The luminous pink-purple bracts are colorful for much of the early summer, and the basal rosettes are attractive in their own right.

Photo by author

Little-Known Cottage Garden Plants from Dry Climates

Gwen's favorite salvia, however, is *Salvia jurisicii*, which grows up to 24 inches tall and even broader, forming a bright lavender-blue mound of color in May and June. If it is cut back hard as flowers go over, it will repeat the performance later in the summer. This salvia is restricted to a tiny area in Yugoslavia in nature, and twists its flowers so that if you examine it carefully you will find they are inverted compared to other sages. The color blends particularly well with a long border of dahlberg daisy (*Dyssodia tenuiloba*), a superlative annual from Texas that produces masses of tiny, bright yellow flowers through the

Gwen Kelaidis has established a dry border garden at her Colorado home. It contains many herbs which thrive on drought, spring bulbs, rue, santolina and lavender. The garden is not watered on a regular basis.



heat of the summer. Rarely seen in gardens, both plants are perfect examples of long blooming, showy and easy flowers that thrive in hot, dry summer regions.

Teucrium orientale superficially resembles a dwarf version of Balkan sage, although it originates in Anatolia and has rather larger individual flowers that have a fascinating, curlicue shape. This is another example of the many Mediterranean plants that thrive in the cold, continental climates of Western America.

A few plants are chosen primarily for their foliage: partridge feather (*Tanacetum densum amani*), bear grass (*Nolina texana*) and Himalayan catnip (*Dracocephalum calophyllum*) are attractive enough in leaf to justify space in the border. Other plants like pine-leaf penstemon (*Penstemon pini-folius*), woolly mullein (*Verbascum bombyciferum*) and dwarf culinary sage (*Salvia officinalis* 'Nana') are as beautiful in evergreen leaf as they are in bloom. So many dry-loving plants have leathery, woolly or elegantly textured foliage that foliage texture has become an important element in this dryland garden.

Like cottage gardens everywhere, Gwen's borders achieve their effect by massing hundreds of attractive flowering plants in close proximity with one another and in such a fashion that there is always color, always interest. The greatest pleasure is observing the kaleidoscopic color changes through the seasons and the years. During protracted hot and dry years, Gwen sets a sprinkler on the garden every few weeks to soak it well. The plants in the garden would undoubtedly survive without water, but flowering would be curtailed.

Dry years are so prevalent throughout much of the western United States, however, that landscape professionals are beginning to question the wisdom of relying on water-wasteful horticulture. Ten years ago, Ken Ball of the Denver Water Board invented the concept of xeriscape,

which has become something of a catchword for reducing water consumption in the landscape. Xeriscape has become a lifestyle for more and more gardeners in this region, who realize that all parts of a garden need not be treated (which is to say watered) equally. Considerable water conservation can take place simply through mulching and other sensible management techniques. Of course, the secret of successful gardening in any climate is to find as many aristocratic plants as possible that grow well under your conditions, and then combine them in delightful ways. This is how Gwen Kelaidis has created a cottage garden in dry Denver clay. ❀

Like cottage gardens everywhere, Gwen's borders achieve their effect through the massing of hundreds of attractive flowering plants closely together. The colors change through the seasons.



Photo by author

A Streetside Cottage Garden

Ruth Robde Haskell

The house we bought in an urban Kansas City neighborhood in 1981 sat high above the street on a terraced corner lot. Steps led up at the very corner of the property instead of straight on, giving more design interest and adding to the quaintness of the stucco house with its steeply pitched red roof. A four-foot limestone retaining wall ran across the front and along the side of the 50- × 135-foot property. Above the wall, the ground rose sharply another four feet or so in elevation, so that the basement of the home was at street level. When we'd first seen the "For Sale" sign and stopped the car, my husband had said "But what about those steep banks?" I knew immediately. "I'll dig in rocks and make a garden out of them." Those banks presented me with the most challenging, rewarding and fun gardening I've ever done.

The 135-foot-long south bank was cut by the driveway, and the back portion ran 65 feet long. Except for the area just south of the house itself, which was already terraced with railroad ties, the banks were covered with what passed for lawn—mostly crabgrass, chickweed and henbit. The west-facing bank had some *Vinca*. Because there wasn't anything there worth saving I had free rein, and I was off on a big adventure.

I turned my attention immediately to the two front portions. The west bank,

across the front, was eight feet deep by 50 feet long; the south-facing bank along the side of the front yard was 10 feet deep by 35 feet long. We roto-tilled the entire front yard, banks and all, and then raked out the clods of grass and weeds—an incredible amount of work! The level part we seeded to create a small lawn. Into the slopes we anchored over half a ton of limestone carefully selected at a local quarry. The stones were there both for looks and to serve as stepping stones and perches as I worked in my future garden. That first fall I planted over 100 daffodils and a Russian olive tree, which I placed at the top of the west bank. To prevent erosion I covered the bare earth with pine needles raked from under neighborhood trees.

The following spring planting began in earnest and didn't let up for three years as I added, moved and refined. I bought many plants, but fully half the garden was populated with plants given by gardening friends. Most came as clumps dug and carried in cardboard boxes. I was lucky to count as friends several dedicated, expert gardeners who enjoy growing perennials from seed, and some of my most prized plants came to me as seedlings. Once, to my great delight, a gardener in Illinois sent seed of fringed cottage pinks, *Dianthus plumarius*, impossible to find commercially.

By and large, planning was done by eye.

I spent hours looking out of windows at the garden, through all seasons, every year. It is one of the most effective design "tools" I know.

The south bank was my pride and joy, baptized the tapestry garden because of the many gray-leaved plants that formed a muted background to the bright flower colors I prefer. On that steep slope there was no such thing as poor drainage, and the aromatic and fragrant plants I love thrived in the sun-baked soil: upright and creeping thymes, lavender, catmint, *Santolina*, yarrow, Russian sage. On a sunny day I could sit on a rock in this mediterranean microclimate, bees buzzing all around, and imagine I was on a hillside in Greece.

I used a mixture of plant forms, paying close attention to texture and stature. To take advantage of the sloping terrain I chose a combination of creeping and mat-forming plants, and cascading plants that would spill down the bank and over the top of the wall. To give height and interest, I included subshrubs and bushy plants, and some with upright forms, which I planted in drifts to give a billowing effect. All of these groups were laced together by creeping thymes, creeping oregano, ground-hugging sedums and sweet alyssum. The tallest plants on my bank were Russian sage (*Perovskia*) and coreopsis, and these I planted no farther than halfway

up the bank. I had to be careful in positioning: Tall plants at the top would look out of proportion. Tall, stiffly vertical forms were excluded; iris foliage was the most vertical form I allowed and I found it very useful to prevent the garden from looking like an unmade bed.

Below the tapestry garden, hybrid day-lilies anchored the wall in a 15-inch wide planting strip. Near the steps the daylilies gave way to perennials added piece by piece from the garden above: Shasta daisies, lamb's-ears, coreopsis and hardy geranium.

The west bank also received full sun most of the day, except for about a third of its length where it was shaded by the Russian olive tree and a neighbor's silver maple. There, daffodils and grape hyacinths bloomed in the full sun of spring, succeeded by perennials tolerant of some shade, predominantly *Heuchera* and *Geranium* cultivars. I added to the existing vinca two special types, *V. minor* 'Flore Pleno' with wine-red double flowers, and 'Miss Jekyll's White', a charming, diminutive plant. In the sunny area of the west bank I continued with these plants and added creeping phlox, sweet william, dwarf lemon lily and an old pale yellow iris gathered from a friend's garden. A single plant of the eastern columbine, *Aquilegia canadensis*, self-seeded until a cloud of red and yellow blooms filled a

quarter of this garden every May and June. Coreopsis also started as a single gift plant and later sprang up all through both banks and even grew out of cracks in the wall.

The strip between the base of the west wall and the sidewalk was a generous five feet. I longed to plant the entire area—50 feet long—with lavender for the sheer, fragrant joy of it, but my husband argued that lawn would better set off the garden above, and actually would be less work and could be counted on, whereas holes were certain to appear in the lavender planting. I relented, but I still harbor secret plans for, someday, a field of lavender backed by a sun-baked wall.

Right: Early morning fog adds an ethereal quality to the author's streetside garden.

Bottom: The south bank became the tapestry garden because of the many gray-leaved plants. They form a muted background for the bright colors the author prefers.



Photos by author



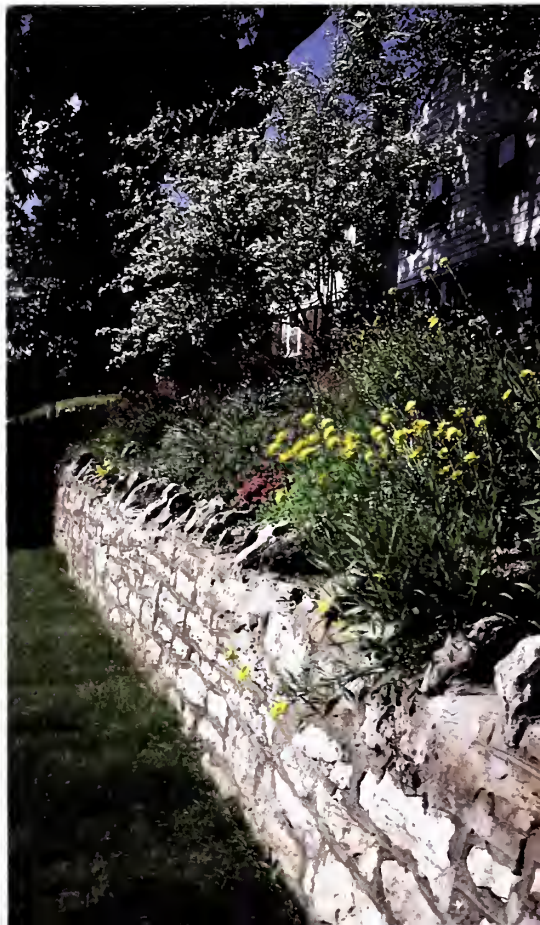


Above: The tapestry garden in early summer, looking east. In the foreground are *Penstemon hirsutus*, *Achillea tomentosa* and *Nepeta mussinii*; in the middle, a single plant of *Penstemon murrayanus* with vivid orange-red flowers and *coreopsis*. Hybrid *Rosa wichuraiana* 'May Queen' climbs the trellis.

Below: The west bank received full sun most of the day except where the Russian olive casts its shade. In early June it perfumes the air with fragrance. Coralbells, hardy geraniums, dwarf lemon lily, *Phlox subulata* and sweet william abound, and *coreopsis* is everywhere.

The problems we had with these banks were weeds, most notably a healthy crop of wild onion. After a good soaking rain I would get out and with hand and trowel, pull and dig. Generally we cultivated by hand with a Cape Cod weeder, a claw-type tool and a trowel. We spent one weekend in the spring and again in the fall cleaning the banks. Thereafter most weeds could be taken care of on my morning and evening rounds when I went out to "take stock." Surprisingly, erosion was never a problem. Bare areas appeared now and then, and were either filled with plants or covered with pine needles.

Being on a corner gave our garden double exposure, and one of the greatest pleasures was the vast number of people who stopped to admire it and have a chat as we were out working. That was an aspect I hadn't counted on when I started the garden, and I enjoyed it immensely. Only once in eight years did I see someone pick a flower uninvited. 🌸



Old Roses for Today's Cottage Garden

Thomas Christopher

Drawing up a plant list for a traditional American cottage garden is a complicated business, for in a country as large and climatically diverse as ours, the gardener's palette must vary from region to region. The sweet williams of a

New England dooryard, for example, give way to more heat-tolerant Drummond phlox around a central Texas farmhouse, while the crape-myrtles of the Deep South are replaced by lilacs in the Midwest. Whatever the location, though, one shrub will always play a prominent role, and that is the rose.

Thomas Christopher studied horticulture at the New York Botanical Garden, and is a widely published garden writer. He is author of In Search Of Lost Roses, published by Summit Books in 1989.

A Garden on Long Island





A Rose Garden at Thomasville, Georgia

Old-time gardeners valued this flower as much for its fragrance as its color. In the days of self-sufficiency, the rose's petals served to perfume homemade soaps and, when gathered into potpourris, to freshen the air inside the house. In addition, the rose's thorns made its canes the ideal material for an impenetrable hedge, while the gymnastic branches of a rambler could soften the appearance of the most austere masonry wall. No wonder, then, that the average cottager would as soon have left the roof off his house as the roses out of his garden.

What will strike contemporary gardeners as most remarkable, however, is that cottagers secured all these benefits with so little work. They didn't keep a weekly schedule of sprays—the only pest control they practiced was to douse each rosebush occasionally with soapy water from the dishpan. Nor did the cottagers protect their roses from winter's cold by

hilling around their crowns with soil and wrapping the canes with burlap. Yet the shrubs flourished. Indeed, many plantings of a century ago still survive, blooming now beside empty cellar holes on homesteads where not only the gardener but even the house has long since passed away.

The secret of the cottagers' success was in their selection of cultivars. They planted roses of proven disease resistance, the types best adapted to the local climate and soil. These they chose by the simplest possible process. They watched their neighbors' gardens to discover the roses that grew well there, and then they borrowed a cutting. The blossoms they got in that fashion might not always win first prize at a rose show, but they were reliable, and a healthy shrub will always outshine a glamorous invalid.

When planning your cottage garden, you cannot do better than to copy the old timers. To avoid the work of rooting cuttings, you will probably wish to buy your bushes ready to plant, but even so, don't begin by opening a catalog. Instead,



'Souvenir de la Malmaison' was named in memory of the Empress Josephine's rose garden. It is a bourbon rose and a representative of one of the oldest classes of reblooming roses.



'Old Blush' is a China rose. It forms a dense shrub as high as six feet with semi-double bluish-pink flowers shaped like architectural rosettes.

Photos by Stephen Scammiello



Above: The secret of the cottagers' success with old roses was their selection of cultivars. They watched what thrived in their neighbor's garden, then asked for a cutting. This one is 'Zephirine Drouhin'.

make an expedition around your neighborhood to find time-tested roses.

Late spring and early summer, the peak of rose season, is the time for such a hunt, and the town cemetery is a good starting point. It was the custom a century ago to plant mother's favorite flower beside her grave, and that was usually a rose. Since gravesites, unlike gardens, don't pass from owner to owner and so are not relandscaped every generation, the rosebushes can grow there undisturbed—and the date on the headstone offers a clue to the age of the flower.

Other places to look are ethnic enclaves—Pennsylvania Dutch communities, for example, whose conservatism has protected old roses from replacement. In the South, the older black neighborhoods are often the best hunting grounds—roses were a special enthusiasm of the women there, many of whom were known locally for their phenomenal skill in the garden. Bypassed rural areas also furnish many finds. I've never seen a display to match the roses growing in the ghost towns of California's gold rush country, and the abandoned farms of upstate New York and New England have furnished my garden with a choice, if more limited, selection. The roses I've discovered on trips to these areas have varied tremendously in appearance, but they all agree in one

respect: They are survivors. Time has weeded out the weaklings.

Identifying your finds will be the next step in introducing these traditional roses into your garden. Botanical keys, indexes of garden roses classified by physical characteristics, are available from horticultural libraries, but personally I find them incomprehensible. Far easier, and more enjoyable too, is to visit a labelled collection of antique roses such as you'll find in the Cranford Rose Garden at Brooklyn Botanic Garden. There you can match your finds, at least approximately, with the cultivars on display. Or contact the experts at the Heritage Rose Group*. With regional chapters covering every part of the country, this fellowship of old-rose fanciers can direct you to someone knowledgeable about the older roses in your area, as well as information about where they can be purchased. Modest annual dues which include the cost of a quarterly

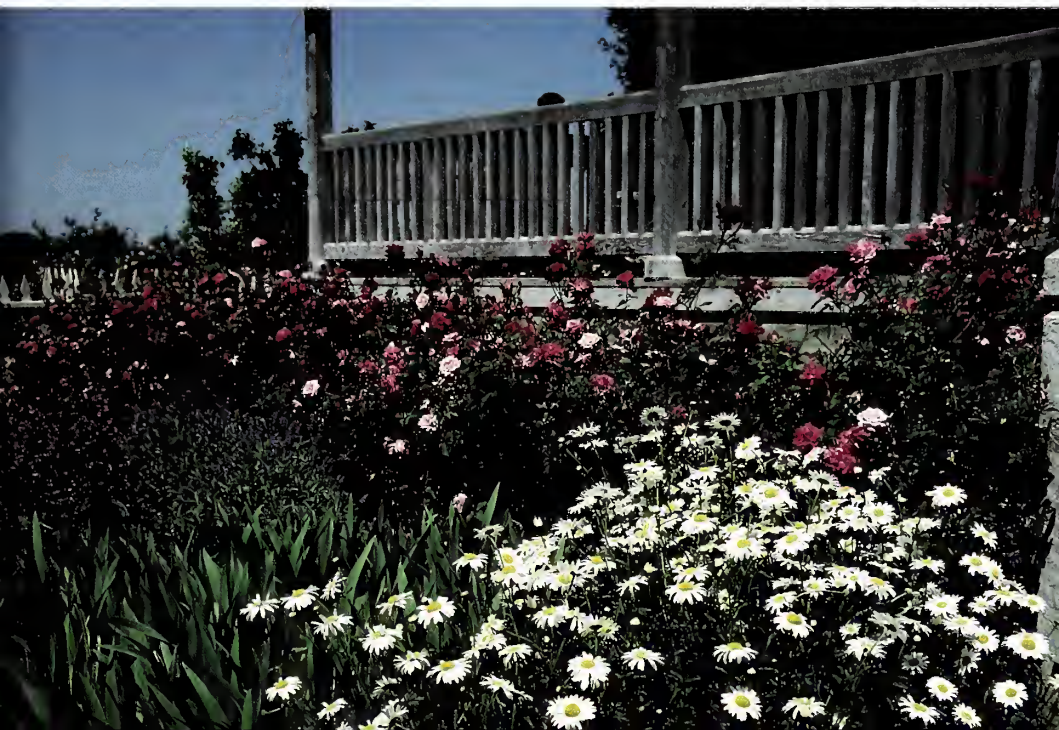
'Archduke Charles' is a China rose that combines well with other garden plants. Here it complements the planting in front of the house.



A close-up view of 'Souvenir de la Malmaison' showing the pale pink flowers which appear intermittently until frost.

newsletter make membership in this organization an outstanding bargain.

Even the most cursory foray into old rose identification is intoxicating, since it reveals the startling selection of blossoms cultivated by cottage gardeners of our great-grandparents' day. Currently, a half dozen giant concerns supply virtually all our roses, and they rarely bother with anything besides hybrid teas and floribundas. The catalogs of a century ago, however, listed a dozen or more classes, each one different in the typical form of the



flowers, the season of bloom and in its regional adaptations. What's more, since there were hundreds of nurserymen hybridizing their own roses, the gardener then had his choice of thousands of cultivars. From this host, I've chosen the following representative sample, a handful of the many that I've found in cottage gardens around the country:

'Tuscany Superb'—This cultivar has been naturalized in America's cottage gardens for more than a century. It is a rose of the ancient French *gallica* class. Wine-colored blossoms with a knot of golden threads at their centers adorn this shrub for three or four weeks in early summer; the three- to four-foot tall canes are as winter hardy as an oak.

'Paul Neyron'—As much as seven inches across, this cultivar's pink flowers are among the largest and the most fragrant of any garden rose. A member of the hybrid perpetual class, 'Paul Neyron' is a star performer in cold climates, blooming heavily in early summer and again occasionally through late fall.

'Hippolyte'—Soft violet in color, the compact flowers of this cultivar arrange their petals in a tight, plump spiral around a central "button eye," with an effect like that of an overstuffed cushion. Almost thornless, this *gallica* rose raises arching branches six feet high and is equally at home in the foothills of California's Sierra Nevadas or in a Northeastern front yard. Blooms for a three- to four-week period from late spring into early summer.

'Souvenir de la Malmaison'—Named in memory of the Empress Josephine's rose garden, this is a bourbon rose, a representative of one of the oldest classes of reblooming roses. After a heavy June flowering it continues producing its broad, pale pink flowers intermittently until frost. Described as "quartered" by rosarians, these blossoms marshal their petals in a cross-shaped pattern. This adaptable rose

withstands northern winters or southern summers with equal aplomb.

'Musk Rose'—A climbing rose whose uniquely spicy perfume has made it a favorite since Shakespeare's time, the musk came to America with the first colonists. A useful complement to the early summer roses, the musk flowers at summer's end, bearing generous clusters of small, five-petalled white blossoms well into September. Hardy north or south.

'Common Moss'—This rose's name derives from the thick growth of resinous green glands that encrusts the flower buds—they really do appear overgrown with an aromatic moss. This feature, together with the fine prickles that sheathe the branches and a shiny green foliage, make this an attractive shrub even when it is not sporting its wheels of clear pink petals. Four to five feet tall, the common moss generally proves frost proof as far north as Boston.

'Old Blush'—A China rose that was brought back to Europe by a Swedish ship's doctor in 1752, this forms a dense shrub as much as six feet tall with semi-double, blush-pink flowers shaped like architectural rosettes. Though the blossoms are nearly scentless, they do rebloom throughout the warm weather. A rose for southern climates, 'Old Blush' is not reliably winter hardy north of Philadelphia but is nearly impervious to heat, humidity and drought. I've seen specimens in central Texas that were flourishing after 50 years of neglect.

'Hermosa'—Another China rose, this one sports globe-shaped, fragrant blossoms of lilac-pink. After a springtime flush of flowers, 'Hermosa' reblooms sparingly through the summer, mounting a renewed display with the arrival of autumn's cool, moist weather. Probably the most common rose of California's gold rush country, this cultivar will tolerate some frost but not the severe cold of northern winters.

'*Champneys' Pink Cluster*'—This climber was introduced by a South Carolina rice planter in 1811. It is one of the first garden roses bred in the United States. The clusters of deep, rose-pink buds open to offer bouquets of small but double, blush-colored, very fragrant flowers. Not hardy north of Philadelphia.

'*Marie Van Houtte*'—A tea rose, so-called because older roses of this class do have a refreshing, oolonglike fragrance. The very double blossoms nod as if too heavy for their stems; the pale yellow petals are tipped with pink. Disease-, insect- and heat-resistant, this reblooming rose is a champion in the South, but not hardy in the North.

As may be gathered from these descriptions, old roses, with the exception of the tea roses, are all, to a greater or lesser degree, seasonal. That is, they produce a heavy flush of bloom at one season, generally in late spring or early summer, and then rebloom sparingly or not at all. This does not mean that their display is less generous. A typical hybrid perpetual yields 95 percent of its bloom in June and July, but in that relatively brief period, it bears more blossoms than the average hybrid tea does over the course of an entire summer and fall.

Cottage gardeners didn't expect their roses to be "everblooming," but many modern gardeners can't abide a seasonal rose. Fortunately, David Austin, an English nurseryman, has recently introduced a happy compromise: the new hybrids he calls his "English Roses." Similar in form and fragrance to the old roses, they pace their flowering like a hybrid tea, producing a steady succession of flowers throughout the growing season.**

Having chosen your roses, how do you incorporate them into the garden in an authentic manner? Probably it was due to a lack of space, but cottage gardeners didn't segregate their roses into a bed of their own. Instead, they wove the roses

right into the tapestry of flowers, vegetables and herbs with which they covered their plots. Gallica roses, for example, a class whose petals were supposed to increase in fragrance as they dried and so were favored for potpourris, cottagers commonly planted among the culinary herbs outside the kitchen door.

Because the old-time roses generally make denser, handsomer shrubs than the twiggy hybrid teas, they work well as accents in a flower border. I've seen the crimson blossoms of China rose 'Fabvier' pose an elegant contrast to the silvered foliage of lamb's-ears (*Stachys byzantina*), and the scarlet flowers of the 'Apothecary Rose' (*Rosa gallica officinalis*—a centuries-old source, as the name suggests, of herbal remedies) combine in a vivid bouquet with the little, daisylike blossoms of feverfew (*Chrysanthemum parthenium*). Some of the cottagers' roses even serve as foliage plants. The canes and foliage of the red-leaf rose (*Rosa rubrifolia*), for example, are colored a rich maroon, furnishing a colorful display long after the shrub's small pink flowers have finished their spring show.

Often, cottage gardeners trained the roses on simple trellises to use them as a structural element within the garden—an arch of roses might shelter the front gate and a curtain of roses shade the porch. But the most striking effect, one that is easily copied, usually came only after a garden was abandoned. A climbing rose adjacent to a tree might take advantage of the caretaker's absence to climb up the trunk and into the branches. The garlands of flowers such a survivor flaunts are one of the most spectacular sights of a rose-explorer's spring. ‡

* Northeast coordinator of Heritage Rose Group is Lily Shohan, R. D. 1, Box 228, Clinton Corners, NY 12514.

** English Roses—These remarkable new roses are available from Wayside Gardens, Hodges, SC 29695 and Pickering Nurseries, 670 Kingston Rd., Pickering, Ontario, Canada L1V 1A6.

Cottage Garden Ornament



A cement hen with her chicks parades across the lawn. True yard art often makes no statement, has no pretenses. The oaks and privet are pruned into smooth balls and tight bedges.

Felder Rushing

Cottage gardens, especially rural ones, have always had some type of ornament to "carry things through" from season to season. Sometimes serious works of art, sometimes castoff *objets trouve*, there are no universally loved styles of "yard art."

True yard art often makes no statement, has no pretenses. It exists only for the pleasure of the gardener and his or her muse. Usually it is a one-of-a-kind. It is even hard to draw conclusions about origins of some art—it may transcend racial and economic lines.

There is a proud difference, when it comes to yard art, between "tacky" and gaudy. A gaudy object is done on purpose, and its owner is given a bit of tacit respect for his efforts. *Tacky* is when he just doesn't know any better, bless his heart.

After screening out all the unoriginal, manufactured plastic doo-dads (whirling windmills, flamingos, sleeping sombreros), all cut-out plywood figures of bent-over gardeners (fanny shots), and a plethora of birdbaths, cement chickens and the like, there remains a fascinating assortment of original ideas. ☺



Above: This old millstone makes a perfect foil in the herb and perennial garden. The color and texture also add interest to the scene.

Right: Pink plastic flamingos seem to be enjoying a resurgence in popularity.

Below: Here is the Bayou chair—the quintessential, universal Southern yard adornment which usually presents itself under several coats of paint, much of it chipped.



Celia Thaxter's Island Garden

Virginia Chisholm



Celia Thaxter was photographed in her garden on Appledore Island. She enjoyed cutting flowers from her garden for the house and often arose early in the morning to spend time working there.

Perhaps one of the smallest and loveliest cottage gardens was begun over a hundred years ago by Celia Thaxter (1835-1894) on Appledore Island. Appledore Island is one of the nine rugged islands that make up the Isles of Shoals located six miles off the coast of New Hampshire.

Celia Thaxter grew up on these islands. Her father, Thomas Laighton, built the first of the huge resort hotels that would eventually line the east coast of Appledore Island. When Celia was 16 she married Levi Thaxter who was 12 years her senior. Levi was an intellectual dreamer who relied on his father, a Boston banker, to support him, his wife and their three sons. Levi's father gave them a house just outside Boston where Celia was expected to do everything from milking the cow to making their clothes. In order to cope with the drudgery, Celia began to compose poetry as she worked. Her first poem, "Landlocked," was published in *The Atlantic Monthly* and was an immediate

Virginia Chisholm is an artist and teacher turned gardener. She restored the gardens at Hamilton House, South Berwick, Maine, for The Society for the Preservation of New England Antiquities. She is chairman of The Moffatt-Ladd House garden in Portsmouth, New Hampshire, owned by The National Society of The Colonial Dames of America in New Hampshire, and she is director of Celia Thaxter's Garden on Appledore Island, the Isles of Shoals. All of these gardens are open to the public.



This is Appledore House which burned in 1914, destroying Celia's cottage in the blaze. The garden was re-established in 1970 on its original site in front of the old foundation.

success. Realizing that poetry could bring in needed income, she wrote for every magazine she could, and soon was very well known. The poems were about the sea and the islands she loved so much.

Her marriage ended when Levi became ill and was advised by his doctors to go south. Levi moved, taking with him the two younger boys. Celia returned to Appledore with her eldest son Karl to care for her ailing mother. She would remain on the island for the rest of her life, except for a six-month tour of Europe and winters spent in Portsmouth, New Hampshire, or Boston. This was the most productive time of her life. Several books of her poetry were published, and one book of prose about the Isles of Shoals. Celia also discovered she could paint, and she decorated one-hundred-piece sets of china with her favorite flowers to augment her small income.

By this time the hotel had grown under the management of her brothers and could sleep 500 and seat 900 in the dining room. People came by the boatful to see the islands and Celia. When she and Levi were living near Boston, Charles Fields, the publisher of *The Atlantic Monthly*, and his

wife Annie became close friends, and through them their coterie of intelligentsia came to know Celia and followed her to Appledore Island summer after summer. The visitors included James Russell Lowell, William Hawthorne, William Dean Howells, Henry Ward Beecher, Harriet Beecher Stowe, Samuel Longfellow, Richard Henry Dana, John Greenleaf Whittier, Sara Orne Jewett, Ole Bull, William Morris Hunt, Ross Turner, Albert Thompson Bricher and Childe Hassam.

Celia eventually inherited her mother's cottage. During the summers, her parlor became like the salons in Europe with daily concerts and readings. In order to reach Celia's parlor, a guest had to pass through the gate and her garden, and as Celia's parlor became famous, so did her garden.

Her friends prevailed upon her to write a book about her garden, but she thought this ridiculous. "It's only a cutting garden, a jumble of flowers." It was a cutting garden, for she enjoyed arranging the flowers for her parlor as much as she enjoyed growing them. In the last years of her life, encouraged by Sara Orne Jewett, Celia wrote "An Island Garden." It is a charming book written in the flowery style of the era and illustrated by Childe Hassam. To those who wish to restore or create a garden of this period, this book is a treasure.

Celia's book takes you through the gardening year in this small 15- by 50-foot garden surrounded by a gray fence to protect it from the strong prevailing winds. A narrow continuous bed runs just inside the fence and nine small raised beds make up the center section. She included a diagram and planting scheme, but in reading the book one realizes that she did not always stick to the same plan. She liked to start her own seeds so the garden is mostly annuals. Celia planted her seeds early in wooden flats kept in south-facing windows. Difficult varieties she started in eggshells. She certainly would approve of the peat pots and plastic trays of today.

There are pages of descriptions of the flowers she grew, as well as the wild

flowers on the island. Most of the flowers are listed only by their common names: hollyhocks, marigolds, stock, zinnia, china asters, single dahlias, sunflowers, sweet william, balsam, poppies (California and especially shirleys), sweet peas, tuberous begonias, larkspur, *Phlox drummondii* and foxglove to name a few. She had just a few perennials, a red peony, white phlox; Scotch, rugosa, polyantha, damask and hybrid perpetual roses; *Lilium candidum*, yellow and orange day lilies and delphinium. Many vines were trained up and over the porch to provide much needed shade:

The garden in early fall is a blaze of color.

There are hollyhocks, marigolds, stock, zinnia, asters, sunflowers, balsam and many other familiar garden flowers of yesteryear.





Photos by author

The garden is planted according to Celia's original plan. Some of the old varieties have been hard to find as flowers go in and out of style.



Japanese hops, wisteria, nasturtium, clematis, honeysuckle, akebia and morning-glory. The same Japanese hops that were used to make beer for the hotel still twine over the back fence of the garden. Shirley poppies were her favorites and these she planted in succession so they could be enjoyed all summer.

Celia rose to work in her garden at four in the morning. This must have been the only time she could be by herself and enjoy the early morning and the flowers she loved so much. Celia died in 1894 just after *An Island Garden* was published. She is buried on Appledore Island with the Laightons. The Appledore House burned in 1914, destroying Celia's cottage in the blaze.

Appledore Island remained deserted until the 1970s when the Shoals Marine Laboratory, a summer school of marine biology run jointly by Cornell University and the University of New Hampshire, was begun by Dr. John Kingsbury. Dr. Kingsbury re-established Celia's garden on its original site, in front of the foundation of her cottage. Since his retirement, I maintain the garden with the help of the

Rye Garden Club. The flowers are grown by the Thompson School of the University of New Hampshire and brought to the island at the end of May to be planted.

In the beginning it was difficult to find seeds of some of the old-fashioned flowers that had not been dwarfed, doubled or so developed that they lost their scent. Now, with the great interest in restoring old gardens, the old varieties of seeds are reappearing. We still cannot find "tall" single dahlias, picotee pinks (*Dianthus*) and some of Celia's roses. The garden is planted according to her diagram, but as the summer goes on, plants are supplemented with those she writes about but does not include in the diagram. It may seem surprising, but flowers go out of style just like clothing. Visitors to the garden are often surprised by the number of flowers they have never seen before. The helianthus, Celia's sunflowers, *Phlox drummondii*, calliopsis, lavatera, venidium, hesperis, crimson flax, mignonette and viscaria that Celia used to illustrate her books are not common today.

Celia planted many white flowers in the garden because she thought they looked lovely in the moonlight. She had a tall white opium poppy she called "The Bride," white petunias, white phlox and white mignonette. Another white plant was the clematis or traveller's-joy (*Clematis vitalba*), which is like the *C. paniculata* that blooms in September. The clematis is no longer in the garden, but seeded over the island by the birds. Its fragrance led us to it, but we have not been successful in reproducing the plant because most of it grows in the most enormous patch of poison ivy one could imagine.

Celia had no problem with water because there was a large reservoir and rain water was collected from the roofs, but then there were no gulls to pollute the water. Now, in order to conserve water from the one well on the island, there is a low sprinkler system with a timer on the center beds.

We have been improving the soil over the years in the same way Celia did, with seaweed, manure and the compost that we ask visitors to bring when they come to the garden. We also keep two compost piles in the corners of the cottage foundation.

Our greatest problem, other than the gulls pulling out every white flower, are the muskrats. We don't have the slugs or sparrows that plagued Celia, but she didn't have gulls or muskrats. The muskrats are a true pest. Last year they broke into the garden three times before we could install new, stronger wire around the bottom of the wooden fence. Naturally, the more special the plant, the faster the muskrats ate it.

Some people who visit are vastly disappointed in this delightful little jewel on this harsh rugged island. Many expect a restored English garden with yew hedges. Certainly Childe Hassam's illustrations in Celia's book might lead one to that conclusion. It is a charming garden, and the colors are brilliant as they so often are on the coast. The interest in the garden is amazing. People come by ferry, by cruise ships and in their own boats. The garden is open from July through Labor Day by permission only, and permission can be obtained by calling the Shoals Marine Laboratory at Cornell University (607-225-3717) or at the island (603-964-9011). The Isles of Shoals Steamship Co. in Portsmouth, New Hampshire, runs a ferry to Star Island, and from there a Boston Whaler will take you across Gosport Harbor to Appledore Island.

It is a delightful day trip. The ferry leaves at 11:00 a.m. from Portsmouth and the return trip leaves Star Island at 3:00 p.m. Appledore Island is rugged and, if you're dressed for hiking and have picnic in hand, there is a lot to explore.

Celia's book *An Island Garden*, with an introduction by Dr. Kingsbury can be purchased through the Shoals Marine Laboratory, G-14-E, Stimson Hall, Cornell

University, Ithaca, NY 14853. Other books about Celia and the Islands are also available. ↩

Celia Thaxter's Plant List

<i>Alcea rosea</i>	hollyhock	Single & double mix
<i>Aster</i>		'Pastelle' mix China
<i>Aquilegia vulgaris</i>	columbine	
<i>Impatiens balsamina</i>	balsam	mix
<i>Begonia</i>		tuberous
<i>Campanula medium</i>	cup-and-saucer	mix
<i>Cleome</i>	spider flower	mix
<i>Cheiranthus cheiri</i>	wallflower	mix
<i>Coreopsis tinctoria</i>	calliopsis	
<i>Coreopsis</i>		donated seeds
<i>Centaurea cyanus</i>	bachelor's-button	
<i>Cosmos</i>		'Sensation' mix
<i>Dahlia</i>		singles only
<i>Delphinium</i>		Pacific
<i>Dianthus barbatus</i>	sweet william	
<i>D. deltoides</i>	maiden pinks	
<i>Digitalis purpurea</i>	foxglove	
<i>Gaillardia</i>		
<i>Helianthus</i>	sunflower	donated from an old garden

<i>Hesperis</i>	sweet rocket	donated from an old garden
<i>Iberis</i>	candytuft	mix
<i>Ipomoea</i>	morning-glory	'Heavenly Blue'
<i>Lathyrus odoratus</i>	sweet pea	climbing mix
<i>Consolida ambigua</i>	larkspur	'Imperial Blue'
<i>Lavatera trimestris</i>		'Mont Blanc'
<i>Lychnis viscaria</i>	rose campion	
<i>Nicotiana</i>	flowering tobacco	mix
<i>Nigella</i>	love-in-the-mist	
<i>Pelargonium</i>	geranium	
<i>Phlox drummondii</i>	drummond phlox	dwarf mix
<i>Petunia</i>		white single
<i>Penstemon</i>	beard-tongue	mix
<i>Reseda</i>	mignonette	white
<i>Tagetes</i>	marigold	orange & yellow
<i>Tropaeolum</i>	nasturtium	mix
<i>Verbena officinalis</i>	vervain	
<i>Viola odorata</i>	pansy	
<i>Zinnia</i>		mix

One waterlily (*Nymphaea*) in a tub In 1989 some 80 trays of seedlings went into this garden.

This is a view of the garden from the vantage point of what would have been the old porch. The arbor provides a nice structural element.



Two Urban Cottage Gardens in the Rockies

Panayoti Kelaidis



Above: The Proctor-Macke garden is really three gardens in one. This century-old brick brownstone is around the corner from Rob's and Dave's first garden. The new garden is planted with cool-loving plants that need only a half day's sun.

Right: Roses and nicotiana complement each other nicely in the garden beside the century-old brick brownstone.

The Rocky Mountains usually summon up images of lofty, snow-covered mountains, or perhaps flowery alpine meadows reflected in pristine montane lakes. While many people come to this region because of the recreational opportunities that mountains provide, residents have gradually discovered that gardening with flowers here offers gratifying rewards. The intense, high altitude sun and crisp mountain air may present obstacles to growing delicate broadleaf evergreens, but these conditions bring out the best in most traditional garden flowers. Indeed, many stalwart plants of cottage gardens, such as McKana columbines, coralbells, gaillardias and penstemons are *bona fide* Rocky Mountain wildflowers that are known and loved in gardens everywhere. Exotics such as Siberian and German irises, old-fashioned shrub roses, butter-and-eggs (*Linaria vulgaris*) and even peonies will persist for generations around old homesteads and ghost towns to remind us that gardening does have a



Photos by Rob Proctor

history in this relatively youthful part of our country.

It is important for gardeners to realize that there are really two very different climatic regions that coexist and sometimes overlap in the Rockies: the high country (roughly above 6000 feet) where the frost-free season is very short and daytime temperatures rarely exceed 80 degrees F in the summer months, and the lowlands (sometimes called the high plains) at altitudes below 6000 feet. Practically all traditional garden perennials thrive at higher elevations, and bloom much longer and more vividly than in warmer climates. Annuals, though popular, are something of a luxury in areas with a frost-free season only a few weeks long! Below 6000 feet, heat and summer drought are limiting factors. Traditional garden plants need frequent irrigation and some shade to do their best. Many unusual perennials from drier climates, like the American Southwest, Western and Central Asia, the Mediterranean basin and South Africa are being introduced and promise a sophisticated new garden palette for this region. And many annuals perform magnificently for months on end.

The dichotomy of high country and lowlands is beautifully illustrated by visiting a few of the many cottage gardens that have grown up in this region recently. Two of the most influential cottage gardens are Rob Proctor's and David Macke's Capitol Hill extravaganza in the heart of Denver at a mere mile of elevation, and the Bay Street Company storefront garden at 9600 feet in Breckenridge, Colorado. Breckenridge is a historic mining town that has tremendous summer tourist traffic and a famous winter ski resort. Over the years, thousands of Colorado residents and "out of staters" have driven past the Bay Street Company and seen a cornucopia of color in the summer months. The Proctor-Macke garden is best known through Rob Proctor's

prolific writing in recent years, as well as his lectures and classes which have made him the pre-eminent spokesman for creative gardening in this region.

Cottage gardens are conventionally associated with rural, or at least sparsely populated, settings where a meadow or farmyard can be glimpsed beyond the flowery verge. Here are two gardens, one in the heart of a mountain village, and the other less than a mile from the Capitol building of the largest metropolis of the Rocky Mountain region, which demonstrate the rich possibilities in this traditional but ever popular style of gardening.

The Proctor-Macke Garden

The Proctor-Macke garden is really three gardens in one. It began as an attempt to rehabilitate the courtyard of a historic apartment complex where Rob and David lived. The dusty courtyard was little more than a graveyard of cement clothesline bases and pitiful turf when the occupants of a dozen units banded together to "add a little color." In two years the edges of the commons had been double dug and filled with a riot of color. Herbs, annuals, perennials and the beginning of Rob's lily collection jostled for space and attention. The hot northwest corner of the courtyard was planted with heat-tolerant natives and Mediterraneans: a giant fountain of *Gaura lindheimeri* blossoms from early summer to frost. Lamb's-ear (*Stachys byzantina*) and coralbells (*Heuchera*) combine in a silver and scarlet *leit motif* which is echoed in all the warm corners of the garden. To the south, under a gnarled, ancient box elder tree (*Acer negundo*), a bench rests on a flagstone semicircular patio edged with white impatiens which overlooks the grassy courtyard surrounded by a kaleidoscopic border of color. Every apartment unit has a ringside view, and vacancies (which occur rarely in this complex, despite Denver's sluggish economy) do not last very long. In the shade around the

bench woodland flowers and shade-loving perennials create a tapestry. Here wild gingers and woodruff carpet the ground, with various ferns and Asiatic lilies rising behind them. Astilbe and aruncus with their filigree foliage, anemones and snowdrops, hellebores, lobelias, many kinds of primroses, hostas and jack-in-the-pulpits—plants not usually associated with the Rockies—thrive here given a little shade and irrigation.

Turning the corner and entering the first of many gates brings one to the backyard of a century-old brick brownstone that fortuitously was put up for sale when Rob and Dave were in the market for a house. The theme of this protected space is a sort of cottage/knot garden featuring cool-loving plants that need only a half day's sun and shaded roots. Some eight or ten planting beds defined by neat grassy paths contain a vast collection of perennials intermingled with Rob's special passion: Asiatic and woodland lilies. Here dozens of species lilies and special hybrids are combined with complementary ground covers that keep their roots cool and provide interest when the lilies' giant goblets are not on display. A six-foot fence was built to mask the adjacent property, a quarter acre of hopelessly trashy, weedy ground begging for attention. In time, this lot also proved an irresistible temptation. The neighborhood church, which owned the lot, had no plans for this eyesore, so like manifest destiny, the cottage garden continued to expand.

This third part of the triptych came to being only in 1987 when tons of debris and weeds were removed and the thin clay was enriched a bit to accommodate a series of gardens in this quintessential urban setting: to the south a parking lot, to the west a picket fence and street, to the north the Macke/Proctor homestead, to the east an alleyway. A border of annuals, perennials and shrubs, designed to soften fence lines, winds in a horseshoe shape around the

entire property. Flower color begins with cool blues and lavenders at the southwest corner, progressing through white and pastel pinks and mauves to purpler and finally redder tones in its very center, heating up to a riot of hot yellows, oranges and scarlets along the eastern border where, even on overcast summer days, most visitors get noticeably agitated. The center of the garden consists of a bountiful vegetable garden and formal herb garden built around an emblematic pineapple sculpture and a trellis.

Practically the entire palette of classic annuals and perennials can be found in one or another of the three parts of this Denver garden: a mass of *Coreopsis verticillata* 'Moonbeam' drifting beneath a mound of albino *Echinacea purpurea* backed by a diaphanous mass of baby's-breath. Clumps of double feverfew in eerie white form an edging to pastel yellow, upright lilies with dark red roses clambering behind. Undulating mats of bright, white snow-on-the-mountain (*Cerastium tomentosum*) alternate with chalk pink *Saponaria ocymoides* in early summer. Yellow and white trumpet lilies are bordered with monarda and a riot of purple, pale yellow and white dwarf perennials along the path to the house. California poppies edge a mass of blue flax in June. These and a hundred more vignettes through the entire growing season have convinced local gardeners of the endless delights and possibilities of traditional flower gardens in the Rocky Mountains. This garden is a testament to the evocative power of the cottage garden—particularly in the heart of a metropolis.

Breckenridge

Breckenridge is far removed psychologically from urban Denver, but this small town situated in the Blue River Valley of Summit County, Colorado, has been built up considerably in the last two decades. The Victorian storefronts along Main



Some eight or ten planting beds defined by neat grassy paths contain a vast collection of perennials intermingled with Rob's special passion: Asiatic and woodland lilies.

Street have been lovingly restored and painted festive colors, and like many Rocky Mountain tourist towns, the number of visitors seems to be related directly to the number of hanging baskets and flowers lavished on the town. While Vail has its window boxes and Winter Park its giant planters, Breckenridge has provided a continuous strip of planting beds along both sides of the street, which are variously planted with wildflowers, annuals, shrubs and even trees.

One corner store in the center of town has a particularly generous strip of land almost 20 feet deep from the street to the recessed storefront. The Bay Street Com-

Right: A lovely mass of iris blooms beside a clump of carnations, providing an interesting accent as well as soft color.

Below: The white wicker chairs invite guests to sit and enjoy the lush beauty of the Proctor-Macke garden. The garden is a lovely retreat from the city streets.



pany, a gift shop, has been owned by Dodie Bingham for ten years. Long an avid gardener, Dodie boasts that she spends her entire advertising budget on plants, a sentiment that inspires local nurserymen to contemplate her canonization. Perennials and would-be annuals such as larkspur and poppies were planted thickly from the very start. Frost can occur in any month (the frost-free season is less than a month most years), and most other businesses don't plant their annuals until well into June. But at the Bay Street Company, the flowering season starts as early as April with the first crocuses, daffodils and even violas, which reveal their alpine origins by being thoroughly perennial here. The procession of color builds quickly in May, and by June the garden is in glorious peak: columbines, lupines, geraniums, shasta daisies, iceland poppies and a jungle of traditional garden plants bloom in top form (with a little judicious dead-heading) the entire summer season. They are joined by tree-sized delphiniums, a large collection of true lilies and virtually the entire pageant of perennials that can be found in most garden books, as well as a few local wildflowers introduced from the lush meadows hereabouts. Most annuals are cut down by the first frosts late in August or early September, but many perennials in this garden progress well into October most years, proving just how important they really are to horticulture in extreme climatic situations.

Both the Proctor-Macke garden and the Bay Street Company garden share qualities associated with most cottage gardens: an intimate setting filled with lush plants that produce a mass of color for the entire growing season. Both gardens are eclectic: Wildflowers, unusual and well-known annuals, perennials, even vegetables are combined under trees and among shrubs to create a panorama of color through the season. The mountain garden at Breckenridge evokes and intensifies the image of

flowery meadows and woodlands that can be found nearby. The city garden is much larger, consisting of a dozen or more discrete units, each of which has its own theme for color, culture and texture. Visitors to either garden are convinced not only of the rich possibilities in cottage gardening, but in the promise of horticulture a mile or two up in the sky.

Ten Cottage Garden Plants from the Rockies

Aquilegia caerulea—This parent of most garden hybrid columbines is always worth growing in its own right, since no hybrid can approach the luminous blue and white of the wild forms. I find the subtle but strong lavender fragrance of the wild species enchanting. Several breeders have begun to select columbines for resistance to leaf miners and heat tolerance as well as superior traits of color and form. Pure colored strains are also being marketed.

Erigeron speciosus—The Aspen daisy has been a popular garden plant in Europe for over a century. Local gardeners are beginning to examine the huge clan of fleabane daisies and asters that are responsible for making at least one Englishman suggest the Rockies be renamed the Daisy Chain. *E. speciosus* is particularly large and lush. *E. peregrinus* is neater and much deeper in flower color.

Eustoma grandiflorum—As with so many native plants, the tulip gentian has had to go abroad (in this case, Japan) to be gussied up a bit in order to be accepted back in the United States. The Japanese selected for sumptuous color and flower size at the expense of longevity. Perhaps they employed Texan rather than more northerly germ plasm. Reliably perennial tulip gentians occur throughout Wyoming, Colorado and Nebraska in white, deep purple and lavender phases. Few native plants bloom for a longer season in the wild or in the garden, and fewer still have such a large and showy flower.

Heuchera sanguinea—Not many people realize that coralbells originated in the southern fringes of the Rockies of New Mexico, Arizona and Chihuahua. Despite their southerly origin, they are indestructibly hardy throughout the Northern Hemisphere, tolerating almost any soil, moisture regime and exposure.

Mertensia ciliata—Virginia bluebells (*M. virginica*) are well known and loved in woodland gardens. They behave much like bulbs, popping up early in spring and disappearing just as promptly. Only a few gardens have introduced Western chiming bells (*M. ciliata*), but these tall, much more substantial perennials have proven to have a very long bloom season and tolerance of many soils and exposures, promising a bright future in gardens. *Mertensia* is a genus largely centered in the Rockies.

Oenothera caespitosa—Only a handful of yellow evening primroses have appeared in the general nursery trade. Western gardeners are mostly familiar with this shimmering white, stemless evening primrose that occurs over much of the dry lowlands up to montane elevations throughout the West. Not only are the flowers huge, but intensely fragrant. Some forms have crinkly, hairy foliage that suggests the frosting on wedding cakes, while other forms can be quite weedy with numerous, unwelcome underground runners. The better forms are fine edgings for cottage gardens.

Oxytropis sericea and *O. lambertii*—Few wildflower spectacles exceed the brilliance of Western landscapes when the locoweeds are at their peak. White loco (*O. sericea*) is very easily grown from seed and can persist for five years or more in a sunny border. The vivid magenta of *O. lambertii* upsets delicate tastes, but delights children and extroverts. It needs better drainage or a dry spot to prove perennial under garden conditions.

Penstemon pinifolius—This plant grows over much the same range as *Heuchera*, has a similarly wide tolerance, and shares coralbells' long bloom season. The colorful Mexican phloxes are promising a similar bright future.

Penstemon strictus 'Bandera'—In the Western mountains, three or four dozen species of penstemons form tall, spikelike inflorescences of dazzling cobalt or gentian blue. Only one, so far, has been selected for uniformity, promptness of germination and tolerance of a wide range of soils and moisture conditions: 'Bandera' is a superlative border plant with bright blue color that rivals *Meconopsis* (blue poppies) and gentians in vividness. Many frustrated gardeners struggle to grow blue poppies while ignoring much more easily accommodated penstemons that are every bit as pure and dazzling in their blues.

Yucca barrimaniae—Yuccas were among Gertrude Jekyll's favorite plants for architectural effect in the garden. The southeastern species are admittedly large and ponderous in a border. Several dwarf western species make lively accents for a warm garden, and this Great Basin species has narrow spikes of a vivid white in late spring that strike a distinctive chord during that busy season.

Zauschneria californica latifolia and *Z. garrettii*—The California fuchsias are neither fuchsias nor restricted to California. Two of the showiest species occur in the southern and middle Rockies. *Z. garrettii* from Utah, Idaho and Wyoming makes compact green mats with bright red-orange trumpets throughout the summer season. It is unquestionably the earliest, hardiest and most adaptable member of the genus. *Z. californica latifolia* grows three to four feet tall and is obscured by deep orange trumpets from August to frost. In cold climates it should be planted in spring, and given lots of room to make a veritable burning bush in a year or two of growth. 🌸



Top: The hot colors combine to attract the eye—the original intent was to “add a little color.”

Photos by Rob Proctor

Bottom: Coral bells (Heuchera) and lamb's-ear combine in a silver and scarlet leitmotif which is echoed in all the warm corners of the gardens such as the above.



Cottage Garden Plants for the Piedmont

Nancy Goodwin

Cottage gardening appeals to everyone who loves growing plants. There is a delicious feeling of escape from one's everyday surroundings when standing in the midst of informal masses of flowers. Although we may become sophisticated in our approach to color, designing monochromatic beds or ones that are planned on graph paper to achieve a perfect balance of color and form, many "well-planned" gardens never achieve the glorious feeling of reveling in the plants the way a cottage garden does.

Many of the best gardens in the South consist of plants handed down from friend to friend, from parents to their children or from one cottage garden to another. That is how so many of the old-fashioned names persist, and how new ones carry meanings beyond the plants themselves. In my own garden I cherish Fanny's aster from an unknown gardener in South Caro-

Colorful nasturtiums, Tropaeolum majus, surround leafy green lettuce in a charming arrangement. Simple combinations in the garden are often the most effective.



Photos by Elrm. McDonald

Many cottage gardens in the South are just outside the back door with herbs, vegetables and flowers grown in perfect harmony. Here Ocimum basilicum 'Spicy Globe' and 'Dark Opal'.

lina, and there are old primulas which have competed with grass and survived neglect during droughts, but which have no recognized name. These are the kinds of plants that form the basis of most cottage gardens. To see the same plants in practically every garden in old towns indicates the quality of friendships there.

Many cottage gardens in the South are just outside the back door where vegetables and flowers are grown in perfect harmony without careful consideration of

Nancy Goodwin started Montrose Nursery in Hillsborough, North Carolina, in 1984. The original idea was to specialize in cyclamens, but the list rapidly expanded to include many perennials. Nancy and her husband moved into their first house in 1963, and she's spent every minute in the garden ever since.

forms or color compatibility. Just getting the plant to perform as it is supposed to is all that matters. There is a charming garden not far from me where teasel, thymes, horehound and other herbs grow at the bases of old roses whose names have long been forgotten. Under some of the larger shrubs can be seen cuttings of more roses under quart mason jars. In the midst of these are Easter lilies grown from the leftover bulbs from grocery store clearances after Easter when the flowers were past their peak. In spring this garden is filled with opium poppies grown in all innocence of their illegal nature. There are masses of *Oenothera speciosa*, evening primrose, more often referred to simply as primroses, spilling over the pavement sometimes in combination with *Lunaria annua*, money plant, cherished for its fruit cases which are cleaned and left as ornaments in the garden or brought inside for dried arrangements or to sell at church bazaars.

Other gardens of this type may be found at the edge of the vegetable patch. The production of food is given priority, but the urge to grow flowers is irresistible. Often these plantings are in straight rows, sometimes almost surreptitiously. There are annuals mixed in with daylilies, *Hemerocallis*, some of which come as divisions from friends and some of which are bought from farmers' markets on Saturdays. Seeds of zinnias and marigolds, saved from year to year, are generally planted throughout the beds so there are old "unimproved" forms to be found. It is a delight to visit gardens of this sort, for each plant is introduced with a story. The owner tells when, how and from whom they came, and more often than not offers to share either seeds or divisions, always accompanied by their personal names, seldom by the botanical ones.

The plants are well tended and yet are given the freedom to spread or to seed. There used to be a wonderful garden in

the center of a neighboring town with a sidewalk leading from the street to the house. On either side of the walkway were hollyhocks, *Alcea rosea*—the tall ones which never seemed to have red spider mites. Larkspur, *Consolida ambigua*, grew profusely with white, shades of blue or pink flowers. There were poppies, *Papaver rhoeas*, the clear, deep red ones that grow wild in Texas, and even some yellow and orange Iceland ones, *P. nudicaule*. But the dominant species was *Papaver somniferum* in white, coral and lavender and both single and double forms. Throughout the garden were *Nigella damascena*, usually called love-in-the-mist, but sometimes love-in-the-midst. Near the edge of the walk, but also appearing in unexpected places, were patches of white sweet alyssum, *Lobularia maritima*. There were fences at one edge of the garden because a boarding house was next door, and trained along it was a deep red climbing rose, which was seldom without a flower. After the main spring and early summer display nasturtiums, *Tropaeolum majus*, were planted along the walk and succulent-leaved portulaca, *Portulaca grandiflora*, in brilliant colors opened whenever the sun was out. The fall garden was filled with asters, *Aster novae-angliae*, many of which were self-sown seedlings and chrysanthemums (now botanically speaking *Dendranthema*), given as cuttings or tiny, shared plants. There was a large bush of "hearts a busting," *Euonymus americana*. These are my memories of cottage gardens.

Creating such a garden is within the grasp of any gardener. An essential characteristic is an opulence of flowers and an unrestrained feeling within the framework. Appropriate plants for the Southeast not mentioned above would include many native species, such as cardinal flower, *Lobelia cardinalis*, pots of gold, *Chrysogonum virginianum*, wild sweet william, *Phlox divaricata*, black-eyed Susan, *Rud-*

beckia hirta, and field daisies, *Chrysanthemum leucanthemum*. There should be peonies, not the unscented single forms as often as the old-fashioned, floppy, fragrant ones such as 'Festiva Maxima'. Pink, blue or white forget-me-nots, *Myosotis sylvatica*, might be naturalized throughout the beds. This is easily done by allowing the seeds to mature before pulling out old plants. The old forms of primroses, *Primula veris*, *P. vulgaris*, the pale yellow *P. x media* and the red and yellow hose-in-hose forms of *P. elatior* are reliable, heat-tolerant plants. Seed-grown forms of dahlias can be had in profusion and will prove perennial with a good mulch in Zone 7, and with no problems in warmer areas. The larger, "fancy" dahlias are equally suitable in such gardens. Cannas look wonderful in many settings, adding dramatic foliage to a bed long before the flowers appear.

There could be masses of bulbs in areas not planted with annuals, so that the danger of destroying them when digging is diminished. The old "swan's neck," white *Narcissus moschatatus* and *N. pseudonarcissus* are frequently grown in old gardens and often may be had for the asking. And there might be some of those double, very early blooming "butter and eggs" ones as well as the incredibly fragrant, bright yellow *N. odoratus* with pencil-thin leaves. The miniature *N. bulbocodium conspicuus* naturalizes easily in sandy soil. 'Twin sisters', *N. x medioluteus*, is one of the last daffodils to bloom, often appearing in May. *Ipheion uniflorum*, spring starflower, is splendid with white or blue flowers and spreads about through lawns; it cooperates with the mower by disappearing at about the time the grass needs cutting. Spring beauty, *Claytonia virginica*, grape hyacinth, *Muscari azureum*, and even the feather hyacinth, *M. comosum* 'Plumosum' are delightful. Spider lilies, *Lycoris radiata*, could appear throughout the planting for late summer and fall color.

Sedums of all sorts look wonderful in such settings. The pink form of *S. spectabile* is in many ways easier to use than the currently popular *S. 'Autumn Joy'* which turns from a pink flower to a rusty brown one. *S. pruinatum* and *S. rupestre* have a pleasant habit of weaving themselves gently among fall blooming Japanese anemones, *Anemone japonica* or *A. tomentosa* 'Robustissima'. Some of the recently introduced South African succulents such as *Delosperma nubigenum* and *D. cooperi* are fine for edging sunny borders. *Coreopsis auriculata* and *C. lanceolata* are delightful in combination with "plumbago," *Cerastostigma plumbaginoides*. Columbines of all sorts can give a feeling of opulence. Plant a native one, *Aquilegia canadensis* or the blue *A. vulgaris* and perhaps some of the long-spurred hybrids and let them interbreed. It is a simple matter to shake the seeds from their cases in late spring and the resulting plants will have many forms and colors. The fall blooming clematis, *C. dioscoreifolia* with its masses of fragrant white flowers may be allowed to sprawl over roses or into trees. It can be cut to the ground in early fall or left to display its seeds throughout the winter.

Annuals seem an essential part of any cottage garden. Ones not previously mentioned include *Cleome hassleriana* in pink, white or lavender, *Cosmos bipinnatus* in pink or white, *Mirabilis jalapa*, four o'clocks and *Viola tricolor*, johnny-jump-ups.

Herbs provide the perfect combination of interesting foliage and flavorings. All of the creeping thymes are suitable if the soil is well drained. These are often listed as *Thymus serpyllum*, but are more correctly found as *T. praecox arcticus*. Lavender is impossible in heavy, wet soil, but wonderful when properly sited in gritty, well-drained loam. Especially nice are *Lavandula stoechas* with its bright red-violet flowers, *L. angustifolia* and the green flowered *L. viridis*. Winter savory, *Satur-*



Photos by Ultem McDonald

oja montana, spreads in a civilized way and is attractive and edible all year. The dark purple or green leaved forms of basil, *Ocimum basilicum*, are superb foliage plants, and holy basil, *O. sanctum*, has a haunting fragrance. Fennel, especially the purple leaved one, *Foeniculum vulgare* 'Rubrum', is a fine cottage plant, better as an ornament than for eating. There are many oreganos available for such gardens. Two are the golden leaved *Origanum vulgare* 'Aureum' which provides an excellent base for dark flowers or foliage, and the charming *O. pulchellum* with its drooping sprays of pink flowers coming out from large, green bracts.

Shrubs provide structure throughout winter and put perennials and annuals into perspective. Excellent ones for this region include *Spiraea thunbergii* which blooms with fragrant, single, white flowers after any mild spell from November through March. Sweet breath of spring, *Lonicera fragrantissima*, has associations for anyone who has lived near it. The small creamy white flowers are fragrant enough to bring back all of the memories of childhood and more. January jasmine, *Jasminum nudiflorum*, is a plant found in many old gardens. The buds tipped with red beg to be brought inside and respond to a little warmth by opening their lovely yellow flowers. Sweet betsy or sweetshrub, *Calycanthus floridus*, is a native shrub with reddish-brown flowers announced by their bananalike fragrance. It is a good plant for shade or part sun. Roses are wonderful in a

cottage garden, but there is a stiffness about the hybrid teas that eliminates them from my list. Instead, choose 'New Dawn', 'Mermaid' or 'Silver Moon' to cover large areas, or 'Blanc Double de Coubert' and 'Frau Dagmar Hastrup' for constant bloom without spraying.

To plan a garden so that it doesn't look planned is a difficult task, for it cannot thrive on benign neglect. The more aggressive plants will destroy their neighbors. A selective process of culling out the less desirable colors and forms while allowing an abundance of growth of those annuals, perennials and bulbs which are acceptable is necessary to achieve the balance desired. As in all interesting gardens, this one will be different every year. ☺

Top: *Phlox divaricata* has a place in the cottage gardens of the Southeast. Plants must be well tended but given the freedom to spread.

Bottom: 'Purple Ruffles' basil is a superb foliage plant. It combines interesting foliage with wonderful flavor.





Peonies are a must in all cottage gardens—especially the ones that are old fashioned, floppy and fragrant.

Cottage Garden Plants

Shrubs:

<i>Calycanthus*</i>	Carolina sweet shrub	<i>Hibiscus mutabilis</i>	Confederate rose
<i>Caryopteris</i>	bluemist, bluebeard	<i>Hibiscus syriacus</i>	rose-of-sharon
<i>Clethra alnifolia</i>	summersweet, sweet pepperbush	<i>Hydrangea</i>	
<i>Daphne*</i>		<i>Juniperus</i>	
<i>Euonymus americana</i>	strawberry bush, hearts a bustin'	<i>Kerria</i>	
<i>Exochorda</i>	pearlbush	<i>Ligustrum</i>	crape myrtle
<i>Hamamelis*</i>	witch hazel	<i>Lonicera fragrantissima*</i>	honeysuckle
		<i>Philadelphus*</i>	mock orange
		<i>Poncirus trifoliata</i>	hardy orange, trifoliate orange

<i>Potentilla fruticosa</i>	cinquefoil
<i>Ribes aureum</i> *	Missouri currant
<i>Rosa</i> *	
<i>Spiraea thunbergii</i> *	
<i>Syringa</i> *	lilac

Vines:

<i>Anredera cordifolia</i> *	Madeira vine
<i>Clematis</i> **	
<i>Ipomoea alba</i> *	moonflower
<i>Ipomoea quamoclit</i>	cypress-vine
<i>Jasminum</i> *	jasmine
<i>Lonicera</i> *	honeysuckle
<i>Passiflora</i>	passionflower
<i>Phaseolus coccineus</i>	scarlet runner bean
<i>Wisteria</i> *	

Ground covers:

<i>Ajuga reptans</i>	bugle weed
<i>Asarum canadense</i>	wild ginger
<i>Asperula odorata</i> *	sweet woodruff
<i>Ceratostigma plumbaginoides</i>	plumbago
<i>Chrysogonum virginianum</i>	
<i>Hedera helix</i>	English ivy
<i>Liriope</i>	lily turf
<i>Origanum vulgare</i> 'Aureum'	golden creeping oregano
<i>Phalaris</i>	ribbon grass, gardener's garters
<i>Ranunculus repens</i>	creeping buttercup
<i>Stachys byzantina</i>	lamb's ears
<i>Thymus</i> *	thyme
<i>Vinca</i>	

Herbaceous plants for sun:

<i>Achillea</i> *	yarrow
<i>Alcea rosea</i>	hollyhock
<i>Allium</i>	
<i>Artemisia</i> *	wormwood
<i>Aurinia saxatilis</i>	hardy alyssum, basket-of-gold
<i>Asclepias tuberosa</i>	butterfly weed
<i>Aster</i>	
<i>Calendula</i>	pot marigold
<i>Catananche</i>	cupid's dart
<i>Celosia</i>	cockscomb
<i>Centaurea</i>	bachelor's button
<i>Cerastium tomentosum</i>	snow-in-summer
<i>Chrysanthemum leucanthemum</i>	oxeye daisy
<i>Chrsanthemum maximum</i>	Shasta daisy
<i>Cleome</i>	spider flower
<i>Consolida ambigua</i>	larkspur
<i>Coreopsis</i>	tickseed
<i>Cosmos</i>	
<i>Delosperma</i>	
<i>Delphinium</i>	
<i>Dianthus</i> *	pink
<i>Dictamnus</i>	gas plant
<i>Dyssodia</i>	Dahlberg daisy
<i>Echinacea</i>	purple coneflower
<i>Erigeron</i>	fleabane
<i>Eryngium</i>	sea holly
<i>Eschscholzia</i>	California poppy
<i>Eustoma</i>	prairie gentian
Herbs**	

<i>Gaura lindheimeri</i>	
<i>Gomphrena</i>	globe amaranth
<i>Helianthemum</i>	sun rose, rock rose
<i>Helichrysum</i>	strawflower
<i>Heemerocallis</i>	daylily
<i>Iris</i>	
<i>Lavandula*</i>	lavender
<i>Liatris</i>	gayfeather
<i>Lilium*</i>	lily
<i>Linaria</i>	toadflax
<i>Lunaria annua</i>	money plant
<i>Lythrum</i>	purple loosestrife
<i>Mirabilis</i>	four o'clocks
<i>Monarda*</i>	bee balm
<i>Nepeta*</i>	catmint
<i>Nicotiana*</i>	flowering tobacco
<i>Nigella damascena</i>	love-in-a-mist
<i>Oenothera speciosa</i>	showy primrose
<i>Paeonia**</i>	peony
<i>Papaver</i>	poppy
<i>Penstemon</i>	beard-tongue
<i>Perovskia*</i>	Russian sage
<i>Physostegia</i>	false dragonhead
<i>Portulaca grandiflora</i>	moss rose
<i>Rudbeckia</i>	coneflower, black-eyed Susan
<i>Salvia*</i>	sage
<i>Santolina*</i>	lavender cotton
<i>Saponaria</i>	soapwort, bouncing bet
<i>Sedum</i>	
<i>Silene</i>	sweet william catchfly

<i>Tagetes*</i>	marigold
<i>Teucrium</i>	germander
<i>Tropaeolum majus</i>	nasturtium
<i>Verbascum</i>	mullein
<i>Zauschneria</i>	California fuchsia
<i>Zinnia</i>	

Herbaceous plants that prefer sun but will bloom in partial shade:

Though most of the spring-flowering bulbs need sun to bloom, they will thrive in the high shade of deciduous trees, blooming and often ripening foliage before tree leaves are fully out.

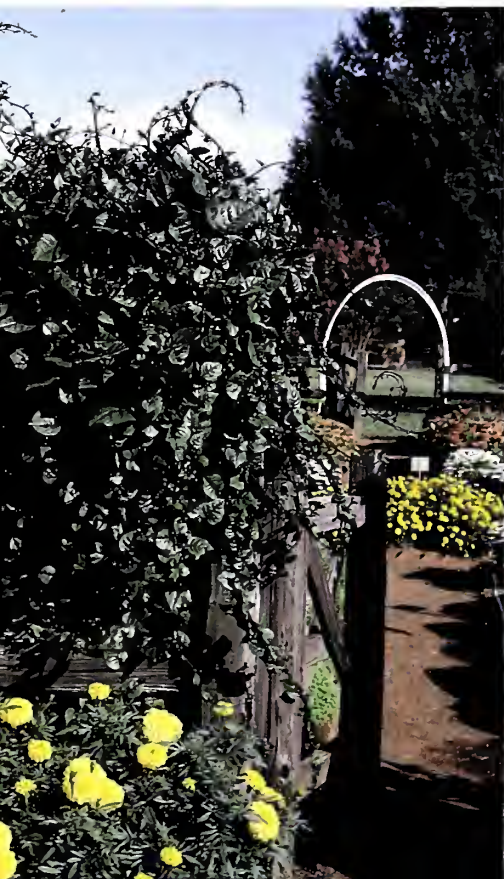
<i>Alchemilla*</i>	lady's-mantle
<i>Anemone japonica</i>	windflower
<i>Anemone sylvestris</i>	
<i>Aquilegia</i>	columbine
<i>Campanula</i>	bellflower
<i>Geranium</i>	
<i>Heuchera</i>	coral bells
<i>Impatiens balsamina</i>	balsam
<i>Lobularia maritima</i>	sweet alyssum
<i>Lupinus</i>	lupine
<i>Lycoris</i>	spider lily, naked lady, surprise lily
<i>Myosotis</i>	forget-me-not
<i>Phlox</i>	
<i>Talinum</i>	jewels-of-Opar

Plants that prefer shade to partial shade:

<i>Arum italicum</i>	
<i>Aruncus</i>	goatsbeard
<i>Astilbe</i>	
<i>Convallaria*</i>	lily-of-the-valley
<i>Cyclamen</i>	



Dark red and white peonies and blue and white iris create a rich tapestry of colors and forms in this garden.



<i>Filipendula</i>	dropwort, meadowsweet
<i>Helleborus</i>	hellebore, Christmas rose, Lenten rose
<i>Hypoestes</i>	polka-dot plant
<i>Lobelia cardinalis</i>	cardinal flower
<i>Mertensia</i>	Virginia bluebell
<i>Primula</i>	primrose
<i>Pulmonaria</i>	lungwort
<i>Stokesia</i>	
<i>Thalictrum</i>	meadow rue
<i>Viola*</i>	violet, pansy, johnny-jump-up

** denotes fragrant or aromatic flowers or foliage*

*** some varieties or species fragrant*

*Marigolds add bright color to the cottage garden and tolerate the heat of summer. The vine growing over the fence is *Basella alba* 'Rubra'; a wonderful substitute for spinach. It is heat tolerant and its red stems are very attractive.*

Useful Addresses

Organizations:

The Cottage Garden
Society
Mrs. P. Carr
15 Faenol Avenue
Abergele, Clywd, LL22
7HT, Great Britain

Heritage Roses Group
c/o Lily Shohan,
Northeast region
coordinator
RD 1, Box 299
Clinton Corners, NY
12514

Heritage Roses Group
Dr. Henry Najat
6365 Wald Road
Monroe, WI 53566

Historical Iris
Preservation Society
c/o Verona Wiekhorst
4855 Santiago Way
Colorado Springs, CO
80917

The Hardy Plant Society
Joanne Walkovic,
Mid-Atlantic group
539 Woodland Avenue
Media, PA 19063

North American Fruit
Explorers
Route 1, Box 94
Chapin, IL 62628
Society for old and
unusual fruits

Nurseries:

Antique Rose Emporium
Route 5, Box 143
Brenham, TX 77833

Appalachian Gardens
Box 82
Waynesboro, PA 17268
Hardy ornamental trees
and shrubs

Peony 'Coral Charm' combines nicely with the soft yellow iris. The foliage of peonies enhances the garden even when the plant is not in bloom.



B & D Lilies
330 P Street
Port Townsend, WA
98368

Bluestone Perennials
7211 Middle Ridge Road
Madison, OH 44057

Busse Gardens
Route 2, Box 238
Cokato, MN 55321

Perennials, especially
hostas, daylilies, peonies

Canyon Creek Nursery
3527 Dry Creek Road
Oroville, CA 95965
Perennial seeds

Carroll Gardens
P.O. Box 310
Westminster, MD 21157
Perennials, shrubs, lilies,
roses

Catnip Acres
Christian Street
Oxford, CT 06483-1224
Herbs

Clifford's Perennial &
Vine
Route 2, Box 328
East Troy, WI 53120
Perennials, clematis,
shrubs

Companion Plants
7247 N. Coolville Ridge
Road
Athens, OH 45701
Herbs

Comstock, Ferre and Co.
P.O. Box 125
Wethersfield, CT 06109
General seed catalog

Country Garden
Route 2, Box 455A
Crivitz, WI 54114
Varieties for cutting

C.A. Cruikshank
1015 Mt. Pleasant Road
Toronto, Ontario M4P
2M1
Bulbs, including many
unusual

Daffodil Mart
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DYES FROM NATURE

PLANTS & GARDENS

BROOKLYN BOTANIC
GARDEN RECORD



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DYES
FROM NATURE

1990



Brooklyn Botanic Garden

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The Unicorn Tapestries were woven about 1500. The colors were made from dyes from plants.

F O R E W O R D

RITA BUCHANAN

U sing dyes from plants dates back thousands of years in all societies around the globe. The first step was identifying potential dye plants; then came learning how to extract the pigments and apply them as dyes. Primitive dyeing techniques were often very elaborate, as the goods to be dyed were alternately treated and dried over a period of weeks or months. Yarns or fabrics were soaked, dipped and coated with a variety of different substances. All this was necessary to achieve

rich and durable colors.

Dyeing was well established as a skilled craft among the ancient civilizations that surrounded the Mediterranean — the Phoenicians, Egyptians, Greeks and Romans. In those cultures, although surely some people dyed their own yarns and clothing at home, most dyeing was done in special workshops equipped with big vats and sinks and drying racks. To the East, dyers from the Caucasus to Persia developed techniques for imparting beautiful vivid colors on wool and silk yarns for weaving their elaborately figured knotted rugs. Seen in museums today, many of these Central Asian tex-

RITA BUCHANAN, the Managing Editor of *Fine Gardening* magazine, is the Guest Editor of this *Handbook*.

tiles are still distinctly colorful; they must have been even more remarkable when they were made hundreds of years ago.

By the Middle Ages in Europe, dyers were well organized into professional guilds, with prolonged training periods for apprentices and high standards for master dyers. The guild system was based on division of labor; growing, processing and using dye plants were separated as different trades. Guilds in different regions often specialized in the use of one or another dvestuff or the dyeing of different fibers. There was considerable rivalry and jealousy between guilds, and dyers frequently attempted to infiltrate each others' workshops and steal trade secrets.

In the cities and more populated regions of the colonial United States, dyeing was again the business of trained craftsmen, many of whom had learned their skills in European workshops and depended on imported dyestuffs. Dyers had an increasing knowledge of chemistry, and began to experiment with different mordants and dyebath additives. In both Europe and the United States, books of dye recipes were written and published for the first time during the 1700s and early 1800s. At the time spinning and weaving were becoming increasingly mechanized, so more and more cloth was being produced. Commercial dye workshops had to handle large quantities and produce consistent results.

A synthetic dye pigment was one of the first products of modern chemistry. In 1856, eighteen-year-old chemistry student William Perkin accidentally discovered a coal-tar derivative that made a vivid purple solution. Curious, he tested it as a dye on silk and had his results confirmed by a major dye house. Perkin was in business within a year, manufacturing the first synthetic aniline dye, which he called mauve. His business

was so successful that he retired at 35 to return to doing research.

Other chemists, especially in Germany, quickly began to study the structure of natural pigments and tried to duplicate them. A process for synthesizing alizarin, the red pigment in madder roots, was patented by 1869. The blue of indigo was described in 1880, and synthetic indigo was marketed after 1897. Although the first synthetic dyes tended to run or bleed into wash water and to fade in the sun, they were bright, inexpensive and very fashionable. Within a few decades after the discovery of synthetic dyes, the market for natural dyestuffs collapsed.

Dyeing with plants enjoyed a rebirth of popularity in the United States in the 1960s and 1970s. Two previous Brooklyn Botanic Garden handbooks — *Dye Plants and Dyeing* in 1964, and *Natural Plant Dyeing* in 1973 — were welcomed by dyers at a time when there were few references to study and few authorities to consult. The 60s generation of enthusiastic and inventive dyers developed many new approaches, rediscovered some old ones and tried all the plants they could gather. Most dyeing was done on wool yarn, and soft muted earth-tones were popular colors in those days.

Continuing interest in natural dyes appears in many ways. Textile hobbyists in developed countries prefer the appealing colors of naturally dyed yarns for their knitting and weaving projects. Craftspeople in underdeveloped countries use natural dyes for economic reasons: The export value of handmade textiles increases if they are dyed with natural rather than synthetic dyes. Dedicated researchers and scholars are discovering and documenting the techniques of dyers long ago and far away. With all this support, it appears that the ancient traditions of natural dyeing with plants will be carried into the 21st century. ❖

COCHINEAL

THE BUG IN THE RUG

GARY N. ROSS

My passion for cochineal began in 1978, when I visited the Zapotec village of Teotitlan del Valle. Most of the men in this semi-arid highland community of more than 5,000 are weavers, and the village is famous throughout Mexico and among connoisseurs worldwide for its hand-loomed tapestries and rugs colored by fine natural dyes. I entered the show-room of Isaac Vasquez, then 43 years old, whose work I had seen in an art gallery in San Antonio. I later learned that he was the most prestigious master weaver and dyer in the contemporary Zapotec culture. My host expounded in slow, deliberate Spanish — his second fluent language — “These colors can only be achieved with natural dyes, and only I and my cousin Alberto Vasquez, whom I taught here in Teotitlan, are willing to take the time to prepare the dye bath as our ancestors did so long ago.”

My eyes fell on the profusion of reds — crimson, scarlet, maroon, mauve, coral, pink and lavender. Isaac noticed my wonderment. “Yes,” he continued, “the reds are especially beautiful and my favorites, too.” Then he added: “Did you

know that we Zapotecs cultivated the dye-producing bug, the cochineal insect, long before the arrival of the Spaniards?” I had to admit my ignorance. The weaver walked to a small table, picked up a jar of what looked like small, gray seeds, and handed it to me. The seeds proved to be the dried bodies of thousands of tiny insects. Isaac explained that the dye is relatively simple to prepare. The brittle bugs “are ground into a powder and boiled in a water solution with lime juice and certain dried leaves.”

I was hooked. Each day of the following week I returned to Teotitlan del Valle and sat for hours observing the various weavers at their looms. Isaac became impressed with my persistence. One afternoon he looked me directly in the eyes and asked: “Would you be interested in documenting the Zapotec method of dyeing?” He explained that he had gleaned the cochineal recipe from the village elders when he was still a boy, and that he had not divulged it to any outsider before. I was honored but told him that for the time being I had to return to Louisiana to resume my teaching and research duties.

Cochineal Natural History

During the next three years, I researched cochineal dye in my spare time. I learned that entomologists classify the dye insect

GARY N. ROSS is a professor of biology at Southern University in Baton Rouge, Louisiana. He has conducted research on insects, handwoven textiles and natural dyestuffs, and Indian cultures in Mexico and Central America for over 25 years.

in the order Homoptera, along with the more typical mealybug and scale insects that plague many house and garden plants. The species name of the bug (now *Dactylopius coccus*) has varied considerably throughout its illustrious past, primarily because there are two distinct forms. A small, wild cochineal lives on prickly pear and similar cacti, which are found from Florida to Arizona and New Mexico, and south into the drier parts of Mexico and Central and South America. The slightly larger form, the cultivated or domesticated type, depends on human care for seasonal protection from the cold and thrives specifically on cacti of the genus *Nopalea*, called *nopal* in Mexico. Both forms of the insect produce the brilliant red dye, but the domestic form, generally preferred because it is larger, is the only one that is commercially available.

The unusual natural histories of the two forms of the insect are virtually identical. Young females settle near their mother in groups of four to ten and secrete from their abdomens a white, weblike material, which accumulates and becomes a cottony puff. This wax-based secretion, more profuse in the wild form, is an effective barrier against desiccation in the semiarid climate and a camouflage against potential predators such as birds, small rodents and other insects. Within her protective cloak, each female is tethered to the cactus pad by a tubelike proboscis. Through this tube she draws nutrients from the host plant for her entire life, up to three years. Within a few weeks of hatching, the female cochineal becomes bloated and sexually mature — a silvery, purplish-black balloon about one-quarter inch long. It is these females that are the source of the dye: A deep maroon pigment pervades their body fluids and tissues.

The male cochineal remains diminutive and mobile. After a few weeks, he

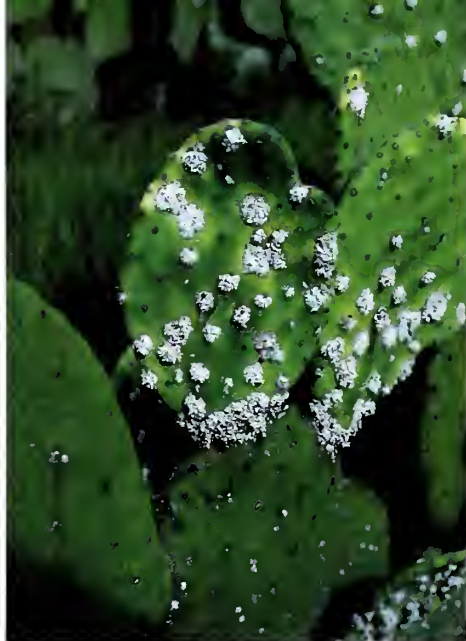
spins a cocoonlike structure and transforms himself into a tiny reddish-brown, soft-bodied, delicate-winged flyer. Lacking mouthparts, the male is instinctively programmed for only one thing, sex, and that he pursues with relentless vigor, moving rapidly among the cactus pads and copulating with as many females as possible. The adult male dies after about a week.

The numerous eggs deposited by the female hatch immediately into tiny, reddish-brown, six-legged specks. Those specks that will eventually become mature females usually remain on their home turf, puncturing the plant's cuticle, or wax layer, in order to get down to the business of feeding and reproducing. Inevitably, however, as the season progresses, the cactus-pad home and nursery becomes overpopulated. No matter. The newly born babies move easily on to greener pastures — an adjacent pad — and set up new colonies. When all the home sites on a plant are taken, the tiny creatures cast their fates to the wind, the successful ones making a suitable landing on a fresh and uninhabited cactus.

Dyeing with Cochineal

Equipped with this background, I returned to Oaxaca to document the insect's use as a textile dye. Isaac wasted no time on my initiation: The day after my arrival we undertook an arduous drive to the lush Pacific lowlands to collect the leaves of the *tejute* or *hoja lisa* (*Miconia argentea*), a medium-sized tree with an umbrella canopy and large, coarse leaves with whitish, heavily veined undersides. After stuffing four large grain sacks with leaves, we backtracked to Isaac's home. Then, while the *tejute* leaves we had obtained dried in the highland's potent sun for several days, my host, the "keeper of dye secrets," filled me in on his art.

Most activities in a Zapotec household are concentrated in the central, open-air



The small cochineal insect feeds on a cactus called nopal, *Nopalea*.

patio. The Vasquez patio has one small area reserved for dyeing, a shaded spot protected by a roof overhang. There a fifteen-gallon aluminum pot rested on a simple tripod of rocks. Stacked nearby was wood gathered from the mountains above the village. First, the pot had to be filled with well water and the fire kindled to bring the contents to a boil. About two hours of heating were required, during which time Isaac and his wife, Maria, prepared the wool and ingredients for the eventual dye bath.

Isaac took three skeins of his wife's handspun woolen thread, about two pounds and soaked them in a tub of clear, cool water. As soon as the dyepot started steaming, three to four handfuls of the dried, crumbled *tejute* leaves were added. My guess is that the leaves contain oxalic acid, as do the leaves of some other members of the plant's family, Melastomaceae. This acid is recognized in the professional dye literature as a color intensifi-

er and mordant for cochineal. (A mordant is a substance, usually a metallic salt, that combines with the dye to form an insoluble colored compound on the fibers of the yarn.)

As the water continued to heat, Isaac plucked approximately eighty fresh limes from a tree that grew conveniently in the middle of his patio and squeezed out the acid juice by hand. I questioned Isaac about his use of citric acid; the citrus family of plants is considered a native of the Old World, having first entered Mexico during the early colonial period. "The Zapotec's use of lime, crucial for the intense red color, dates only to the sixteenth century," Isaac responded. "Before then some alternative natural plant or soil acid must have been used." He sighed, and then added: "But my investigations have uncovered no written or spoken records; the secret remains in a world we have lost."

While Isaac squeezed the limes, Maria prepared the cochineal insects for the dye. Since the supply in Mexico is now very limited, the weavers purchased their dried insects from Peru for about forty-seven dollars a pound, some 70,000 insects — a bargain since each bug must be tediously handpicked, swiftly killed by immersion in boiling water, which also dissolves its wax coating, and then dried in the sun for several weeks. As an emergency reserve, Isaac maintains a small colony of the insects on a grove of nopal cactus growing in his backyard.

Maria placed a *metate*, or "grinding stone," in front of her on the patio floor, and using a stone rolling pin, ground the dried bugs in much the same way she would grind corn for tortillas. Within thirty minutes, she had transformed one-half pound of the drab bugs into a colored powder. The grinding complete, Maria removed the powder and rinsed the *metate* with a cup of water, carefully

collecting the runoff: Cochineal is too valuable to waste.

When the water was boiling, Isaac added the powder and the salvaged dregs, and the solution became a dark red. He stirred the dye for a few minutes with a stick bearing the tenacious stains of past dye pots, then added the lime juice. The dye turned a brilliant red. Finally the three skeins of wet woolen threads were lowered into the boiling cauldron, and the solution was kept simmering for one and one-half hours.

Soon I understood why Isaac Vasquez is an internationally esteemed master of his craft. The wool's final color depends on many factors, including its initial color, ranging from white to various shades of gray, brown and nearly black; the length of time the wool is in the dye bath; the amount of cochineal powder used; and the amount and type of lime used (Isaac used the juice from fresh limes, but his cousin Alberto prefers whole dried limes.) By manipulation of these factors, countless hues within the red spectrum can be created. Since the precise conditions are never recorded, however, only his years of experience and perceptive eye endow Isaac with a sensitive control of these natural colors, a control that can be admired and even envied, but never copied.

When Isaac gauged that the wool had reached the appropriate color, the skeins of thread were removed from the dye bath, shaken vigorously to dislodge the fragments of *tejute* leaves and limes, and hung on a nearby tree limb to cool and dry overnight. The exhausted dye bath was then thrown out. When Isaac needs a relatively muted pastel, he will reuse the solution immediately for dyeing additional wools. He may also use it for over dyeing, a process in which threads previously dyed with one color are redyed with a second to achieve an uncommon hue. Be-

PHOTO BY AUTHOR



The reds in this hand-woven Mexican tapestry were all derived from cochineal.

cause there is no refrigeration to protect the organic ingredients from spoiling, at day's end the solution in any case has the same fate. It is poured onto the bare ground of the patio.

The following day, we packed the pungent threads into my pickup and travelled the three miles of rocky road above the village to a small trickling stream. There Isaac washed the threads in a bucket of sudsy water (Fab is the product of choice) and rinsed them thoroughly in the flowing stream. The *tejute* leaves had done their job once again; the threads retained their intense red color. Back in the village, the skeins were suspended from a tree limb for two to three days of final drying before being transformed on the loom into works of art. ❖

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DYEING IN THE HIMALAYAS

DIANA K. MYERS

The Tibetan culture area of South Asia has as its axis the Himalayas, a spectacular range of peaks stretching from Afghanistan in the west to Burma in the east. Lying in the tropics, this area boasts some of the most dramatic topography in the world. Lush forests blanket the hills which rise steeply from the Indian plains to become the highest mountains in the world. North of the main range is the arid, windswept Tibetan plateau, lying over 12,000 feet high in the rainshadow of the Himalayas. The sphere of Tibetan cultural influence thus includes diverse climatic zones: Ladakh in northwest India and Tibet itself are part of the high-altitude plateau, while Nepal and Bhutan are nestled on the temperate slopes south of the permanent snows. This essay incorporates observations from Ladakh, Sikkim and West Bengal in India; Nepal, southern Tibet, and Bhutan.

The cultures of these distant areas were linked historically through trade and political alliances as well as through Buddhism, introduced to the region in the seventh century. It was not only religious pilgrims, diplomats and merchants who criss-crossed these long distances

south of the famous Silk Route. Members of the central Tibetan royal family fled upheavals in Lhasa and founded a dynasty in Ladakh in the tenth century, while a remarkable abbot from southern Tibet united Bhutan as a Buddhist state in the seventeenth century. The cultures of Ladakh and Bhutan evolved quite distinctly from that of Tibet although the arts, crafts, costumes and other aspects of these far-flung communities show important similarities. Nepalese culture includes Tibetan Buddhist elements as well, although today the kingdom is Hindu.

Early Western visitors to the Himalayas recorded little information on weaving and dyeing, so much of our knowledge of traditional practice is inferred from present custom. We do know that wool, salt and borax from Tibet and Ladakh were exchanged across mountain passes for cotton, silk, paper, medicinal herbs and dyeplants from the south. The impact on this trade — and therefore on dyeing materials and methods — of twentieth century political events, which first brought an influx of manufactured goods and then closed Himalayan borders, cannot be underestimated. Nevertheless, some communities have never abandoned or are now re-adopting the weaving materials and dyeing practices of earlier generations.

The arts of weaving and dyeing are widely practiced throughout the Hi-

DIANA K. MYERS began studying Himalayan weaving while serving in the Peace Corps in Nepal. She is the author of *Temple, Household, Horseback: Rugs of the Tibetan Plateau* (The Textile Museum, 1984) and now directs development and training programs for the *Experiment in International Living*.

malavas, especially in rural areas where the change is slow to occur. Fabrics are woven for a tremendous variety of utilitarian goods: costumes, animal trappings, blankets, pile rugs, tents, doorway and floor coverings, cushion covers, bags and numerous ceremonial textiles used in monasteries and in secular and religious ritual.

The most common weaving fibers are sheep's wool, cotton and raw silk. Yarns may be left natural or tinted, and dyeing is generally done prior to weaving. In some Himalayan areas dyeing is a specialized occupation and in others it is carried out more widely. This appears to be partly a function of geography and climate, for dyeing requires large amounts of fuel (wood or dung) to heat the dye vats, sometimes for days. Thus it is done less in barren regions of Tibet and Ladakh than in temperate valleys where forests and animal herds provided plentiful fuel. In Ladakh, dyeing for each community is done by only a few households, because dung is limited and wood expensive. In heavily forested Bhutan, dyeing is done in many more homes and generally by women. Some individuals are known as particularly skilled dyers, but virtually every woman who weaves knows how to color her yarns.

Himalayan villagers traditionally employed a standard selection of dyeplants obtained through trade and supplemented those with local materials or variants. The most important of these survive in use today, both as sole coloring agents and as overdyes to enhance the color of commercial yarns. Synthetic dyes arrived gradually in the Himalayas and their impact was uneven. They were available in some areas as early as the 1870s, but other regions did not see their advent until the 1950s. Nowadays, commercial dyes, yarns and fabrics predominate, because they are inexpensive, easily available and

labor-efficient. At the same time, traditional textiles, dyeing materials and techniques are valued. Many rural Bhutanese, for example, are fond of the vibrant colors resulting from store-bought dyes, but consider synthetic tints inferior to hues achieved with natural dyes. Bhutanese in urban areas are leading a change in fashion where subtle colors and traditional design are once more favored over polyester and brightly tinted garments from abroad.

The most important traditional vegetable dyestuffs are madder, indigo, rhubarb, myrobalans, sweetleaf, walnut, lac and wood sorrel. Historically, safflower was also a major dye. Methods of extracting color from these substances are quite similar across the region, although recipes vary according to the materials locally available and the fiber being tinted. Mordants include natural salts and sulphates found on the banks of rivers and lakes and near hot springs: primarily borax, common soda, alum and copper sulphate. Millet or barley beer often serves as a reducing agent in indigo recipes, while rhubarb root and various fruits and leaves provide acidic juices for modifying and fixing other colors.

Madder

***RUBIA* spp.**

The most popular natural source of red, madder is the common name of several species of the *Rubia* plant, a creeper native to the Himalayas. Varieties are found in Ladakh and southern Tibet, but the hills of eastern Nepal and Bhutan are most abundant in the plant, which people would "gather in the jungle, cut...up into small pieces and carry...away into Tibet, where a rich red dye is extracted from it." Early visitors noted the important trade where Tibetan salt was exchanged for madder from Bhutan and Nepal; taxes were also paid with the dyeplant.



A Tibetan refugee in Nepal dyes wool with churtsa, rhubarb root.

South of the Himalayas, wild madder stems and roots are harvested in April-May and may be used for dyeing when fresh or dried; if dried, they are sometimes ground into powder. Dyeing involved heating large quantities of madder with the yarn, which is treated with a mordant such as alum, myrobalan or soda before and/or afterwards. Shades obtained are pink, red and brown as well as orange (in combination with turmeric).

Indigo

STROBILANTHES AND OTHER PLANTS CONTAINING INDIGOTIN

For blues, Tibetans and other Himalayans relied heavily on indigo imported from China and India, where its commercial production had been of worldwide importance since the end of the eighteenth century. Dyers also obtained blue from local plants containing indigotin that were available in areas



Symplocos sp. contain a yellow pigment popular in the Himalayas as a dye and mordant.

near Burma and China. In Bhutan, blue comes from several of these broad-leaved shrubs collectively known as "indigo" (*Strobilanthes* sp.).

Leaves of these plants are gathered in the wild, dried and ground. The intricacies begin in processing the dye: First the cakes of powder are fermented in a solution of hardwood ashes, or cow's urine and water, or oxalic acid from rhubarb juice, or local beer, or yeast. Recipes differ, but all call for careful monitoring of this fermentation and the temperature level during successive steps in the dyeing process. Adjustments may be made in the recipe in order to achieve the desired color: The first dyelot is a light blue, with two to four steepings yielding deeper shades. The entire procedure may take up to six months in some areas, with attention paid to the season, the placement of the clay pots in which the dye ferments, and the number of times

the mixture is stirred.

Not surprisingly, the indigo-dyeing process is easily spoiled. Hence Tibetans believe it should be done by one person (specifically not a menstruating woman), in a quiet place where no one can observe the first steeping of the yarn. Bhutanese feel pregnant women should not be involved lest the color be "stolen" by the baby; nor should strangers witness the activity, lest they take away the color.

Rhubarb
RHEUM spp.

The most common source of yellow in Ladakh and parts of Tibet, and today among Tibetan refugees in Nepal, is rhubarb root. Rhubarb species, which abound from one end of the Himalayas to the other, have long been sought after as a local dye. The Mongols likewise valued the roots for coloring. In some areas, the roots served as medicine, too.



The woman spinning wool above is wearing a robe dyed with madder.



Shawl of white cotton patterned with raw silk dyed with indigo and madder.

and the leaves of the plants were smoked like tobacco.

Dug up in autumn, rhubarb roots are cut into pieces an inch or so long, dried and powdered. When boiled in a plain or salt solution with yarn, the dye yields strong, bright shades of orange, gold or yellow. With soda as a mordant, yarn dried in the sun turns pink. Less commonly used, rhubarb leaves tint yarn pale yellow.

Myrobalans

TERMINALIA CHEBULA, *T. SPP.*

Along with rhubarb root, myrobalans are common agents for yellow. Sour fruits of trees of the *Terminalia* genus, which grow below 5,000 feet, myrobalans are mentioned as a major Himalayan dye as early as the mid-seventeenth century. Important, like rhubarb, for medicinal purposes (the Buddha of medicine holds a myrobalan leaf), they yield a golden brown color or serve to darken indigo and other dyes. The two most common species (*T. chebula* and *T. bellirica*) have a high tannic acid content which makes them excellent mordants as well.

The fruits and galls of the leaves, mixed with alum, produce "a most durable yellow" on cotton, silk and wool. Mixed with iron salts, the fruits turn wool a dark gray. With safflower, madder and other dyestuffs, the astringent fruits function as a mordant.

Sweetleaf

SYMPLOCOS RACEMOSA, *S. SPP.*

The leaves of at least three species of *Symplocos* contain a yellow pigment and are popular as a Himalayan dye and mordant. *Zhungkhe* (*S. racemosa*) is one of several related shrubs native to the higher hills of India, Sikkim and Bhutan. The leaves, and sometimes the bark, are gathered in the wild (in the Darjeeling area, they are picked in spring) and dried for dyeing.

Leaves are chopped before being

boiled with cotton or wool. Very often turmeric and coarsely ground buckwheat grains may be added to the dyebath to heighten color, while madder leaves and twigs are stirred in to produce orange and rust. *Symplocos* is also an important mordant used with madder and with local sources of indigo.

Walnut

JUGLANS REGIA

Walnut trees grow throughout temperate regions of the Tibetan plateau and southern Himalayan hills. The husks of their fruit provide the main brown dye and serve as a darkening agent. There are several methods of using walnut as a dye. In Ladakh, green husks steeped in boiling water yield a light yellow-brown, fixed with salt. Alternatively, dried husks may be boiled whole to achieve browns, primarily on wool yarn. Elsewhere the husks of unripe walnuts are stored in pots of water to rot before being dried and powdered; various shades of brown result from this dye-bath, whose acidity is varied by adding rhubarb juice or soda. In the eastern Himalayas, informants describe using the bark or roots of walnut for paler tints of brown, but say these materials do not produce the same strong colors.

Lac

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The only regional dye cultivated as an industry of sorts is lac. Like madder, it was an important Bhutanese export to Tibet, Nepal and India, and to a lesser extent to Ladakh. While lac production was never very systematic and its scale has greatly diminished in this century, in the warm eastern valleys of Bhutan, landowners still register the trees on their land which are used for rearing the lac-secreting insects.

From May onwards, these insects feed on several shrubs, the most important of

which is *Butea monosperma*. By fall, they have secreted hard "cocoon" which attach them to the twigs; at this time the twigs are gathered and hung on the branches of a type of shrub (*Zizyphus* sp.) where the insects continue to feed and lay eggs over the winter. When the weather warms, the shell-like encrustations, known as stick lac, are harvested and the next generation of insects is moved to the *B. monosperma* once again.

For dyeing, the lac is crushed and then made into a paste with water and yeast. Wheat flour is added and the mixture fermented in a clay or stone pot. In Sikkim, this preparation is warmed over a low fire for one week and in Ladakh lac dyeing is done in the summer when the sun hastens fermentation. During this gradual heating, a white residue rises to the surface and is skimmed off. Wool is then soaked for up to 20 days in the solution. In Bhutan, the solution is boiled down to obtain a dye concentrate, and fibers are prepared for receiving the color by steeping in a solution of sweetleaf.

Various ingredients are added to modify the shade. With alum, lac produces crimson; with iron, purple; and with salt, scarlet. Maroon is obtained by immersing lac-dyed yarns into a solution of indigo.

Wood Sorrel

RUMEX NEPALENSIS

Greens are usually achieved by overdyeing a blue yarn with rhubarb or barberry, but several plants produce greenish hues. The best color is considered to come from *Rumex nepalensis*, known in the Darjeeling area as "dog leaf." A shrub found from Bhutan to Kashmir and in the Chumbi Valley of Tibet, its leaves yield a light green which is darkened by adding the roots to the dyebath. This variety of *Rumex* should not be confused with common sorrel (*R. acetosa*), whose roots produce red, or with common dock

(*R. obtusifolia*) whose roots produce black; neither seems to be known in the Himalayas.

Safflower

CARTHAMUS TINCTORIA

Another important source of red, especially for woolen fabrics, is Tibetan safflower or wild saffron, distinct from Kashmiri saffron, which produces yellow rather than red. Native to temperate areas from Bengal to western China, but not found in Tibet, this plant grows about three feet high. Its stamens contain the pigment carthamine. Picked in spring, the flowers were exported to Tibet and used to color narrow lengths of woolen twill then traded to China and other regions. Because of its association with this famous fabric, the distinctive color safflower produces was known to the Chinese as "Tibetan red."

Recipes for dyeing with safflower call for the addition of soda or myrobalans. It was also used as a compound tint with indigo. Outside Tibet, it was mainly used in combination with lemon juice or other acidic mordants to dye cotton and silk.

Today in the Himalayas, indigo, madder, rhubarb root and walnut are the most prevalent natural dyes, but lac and myrobalans are also popular. In Sikkim and Darjeeling, *Symplocos*, *Rumex nepalensis* and barberry are widely used. Some of the less familiar plants are collected as they always have been by villagers residing in high-altitude valleys from Ladakh to Bhutan. The colors obtained, however, vary with the chemical content of local water as well as with the mordants used — and still depend greatly on the dyer's skill. ♦

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K A L A M K A R I



DYE-PAINTED FABRICS OF SRI KALAHASTI

M. JOAN LINTAULT

Southeastern India has long been famous for its richly decorated, naturally dyed cotton fabrics. They have been known throughout Asia for more than 1500 years, and traded to the West since the 16th century. From the time of their introduction, the exotic patterned fabrics called "chintz" (from a Sanskrit word meaning spotted or bright) were all the rage in Europe. Indian cotton cloth was valued not only for the beauty of the designs, but also for the richness of its colors and its wearability. There was nothing equal to it in the West. Chintz was used for garments, bed clothes and home furnishings.

In India, bright-colored decorated fabrics are called kalamkari. These can be either block printed or hand painted. A special type of kalamkari comes from the town of Sri Kalahasti in the state of Andhra Pradesh. These fabrics feature handpainted designs that depict stories from the great Indian epics. Traditionally, they might have been used as narrative picture scrolls by storytellers who recited tales to an audience, or displayed on temple walls during festivals. Now the kalamkari painting process is used to decorate cloth for wall hangings, door curtains, table cloths, saris and other articles.

The art of making kalamkari had nearly died out in the 1950s when the All-India Handicrafts Board engaged the last surviving kalamkari expert to start a school and teach the craft to five young boys, including his son Gurappa Chetty. I visited Sri Kalahasti, and met Gurappa Chetty. He is very much a traditional craftsman, and inherited from his father a reverence for the Kalamkari patterns that have been handed down for generations. Although each Kalamkari artist has his own style of line quality and



Guarappa Chetty applies alum mordant.



A closeup of the artist drawing freehand.

M. JOAN LINTAULT teaches art at Southern Illinois University in Carbondale, Illinois.

graphic expression, there is a similarity in the colors, the divisions of the compositions, and the forms, postures and expressions of the figures.

Kalamkari artists never draw from life or nature. Their subjects are inspired by the words of the epics. They paint scenes across the fabric from left to right, accompanied by commentary written in Telegu, the language of Sri Kalahasti. Some artists outline their drawings on the cloth with charcoal made from tamarind twigs, but Gurappa Chetty usually paints freehand without benefit of preliminary sketches. He is able to maintain correct proportions of the body, and has a fluid style of line and an amazing sense of pattern and decoration.

Although Gurappa Chetty devotes all his time to his art, he does not have a studio. All his work is done on his front verandah. In India, life happens in the open, not behind closed doors. Everyone speaks to him as they pass by. Vendors, children and friends visit. Animals slowly wander down the street. Life swirls around Gurappa Chetty as he paints his kalamkari.

Kalamkari Technique

Making a kalamkari requires a series of steps that extend over a period of several weeks. First the fabric, a cotton muslin called gadda, is washed well to remove all the starch and sizing. Then it is mordanted with a solution of powdered myrobalan fruit (*Terminalia chebula*), which is high in tannic acid, and water buffalo milk. The milk is important because its high fat content coats the fabric and increases dye absorption, so the dyes then may be applied without wicking. The cloth is soaked in the solution, then tightly wrung several times, and spread out in the sun to dry. It has a yellowish color at this stage.

A kalamkari artist uses a homemade

pen called a kalam, made from a piece of bamboo or other straight stick sharpened to a point at one end and wrapped with a rough piece of cloth or hair held in place with string. The artist dips the kalam into dye, which soaks into the cloth, then gently squeezes the cloth to make the dye run down the stick and onto the fabric. It takes a great deal of skill to use just the right amount of pressure to avoid making blots on the design.

The first dye to be applied is called kasam. It is a clear liquid made by soaking pieces of iron in palm sugar syrup (jaggery) for 21 days. This is the traditional method for making iron acetate. When this dye is applied to the myrobalan-mordanted cloth, the high tannic acid content of the myrobalan combines with the iron and gradually turns the cloth a permanent jet black. This dye is used to create the outlines of the design.

After the outlines have been drawn, the cloth is prepared for red dyeing. A kalam is used to apply a solution of alum water to the areas that will be red, pink, orange or purple. The cloth is dried, then rinsed very well in swift-flowing water. This is an important step, as careless rinsing results in the alum spreading to other areas.

Then the alum-mordanted cloth is dyed in a solution of poblaku leaf (*Nagrigama alta*), surudu root bark (*Ventilago madraspatana*) and majnistry or madder root (*Rubia cordifolia*). The powdered dyestuffs are mixed with water, the cloth added, and everything is boiled for one hour in a brass, copper or pottery vessel. When removed from the dyepot, the alum-treated areas are darker red, and the surrounding areas are pink. If several shades of red are required, the fabric is dipped again in the myrobalan/milk solution, then treated with alum and redyed. Repeated dyeing gives a deeper,

more permanent red.

At this point, the cloth has an overall tinge of red, which must be removed so that the other colors can be applied to a clear background. To bleach out the unwanted red, the cloth is soaked overnight in sheep or buffalo dung mixed with water, then squeezed and spread on the wet sand of a riverbank. For several days to a week, it is sprinkled repeatedly with water and turned so that both sides are exposed to the sun. There is some ingredient (perhaps ammonia or uric acid) in the dung of a vegetable-eating animal that, combined with the sun, has a bleaching effect. After this treatment, the portions of cloth painted with iron and alum solutions retain their colors (black and red, respectively) but

the rest is bleached white.

The next step is dyeing with yellow. The cloth is soaked in buffalo milk, and wherever yellow or green colors are desired, dye is applied with the kalam. The yellow dye is made from powdered myrobalan, mango bark or pomegranate husks, boiled with water and alum. The dyed cloth is dried in the sun, then washed in running water.

Blue is the last color to be added. Traditionally, wax was applied to all the areas that were not to be dyed blue. Then the cloth was dyed in indigo. Indigo over yellow gave green. Today most kalamkari craftsmen use a synthetic blue dye instead of indigo, and apply it with the kalam. Then the cloth is washed and dried one final time. ❖

G R O W I N G M A D D E R

Rita Buchanan

Madder (*Rubia tinctorum*) is a hardy perennial native to the Middle East, with slim four-sided stems, whorls of slender pointed leaves, and tiny white flowers. Weedy-looking and prickly-textured, it sprawls over the ground to form a low wide mat. Madder seeds are rarely listed for sale, but you can order plants from several mail-order nurseries. Buy one or two to start with, and you can divide them over time to multiply your stock. Prepare a madder bed by digging at least 12 inches deep and working plenty of compost, manure and lime into the soil. In late spring, set

plants 18 inches to 24 inches apart. When the madder tops get a foot tall, pull them down to the ground and draw a little soil over the middle of the stems so that they will form new roots. Do this several times a season for three years in order to make a solid bed of plants and roots. In spring of the third year, pull out a few plants to start a new bed in fresh soil. That fall, use a digging fork and work through the soil to harvest your crop of madder roots. There will be quite a tangle of them, thick as pencils and bright red-orange. Wash the roots thoroughly, and use them fresh or dry them for storage.



These women are waiting for the dyed cloth to dry before dipping it in the river again and again to refine the color.

ENDURING DYE TRADITIONS OF CHINA'S MIAO AND DONG PEOPLE

GAIL ROSSI

Ancient dyeing methods still play an important part in the everyday lives of women inhabiting remote mountain regions of China's southwest in Guizhou, Guangxi and Hunan provinces. The geographical

isolation of these rugged areas, where nationalities such as the Miao and Dong live, has helped preserve a wide range of unusual textile traditions. Making and wearing unique traditional costumes not only maintains cultural identity, but also remains an important way for a young woman to attract a desirable marriage partner. A woman's festive garment is a reflection of her creativity, diligence and skill.

GAIL ROSSI is a weaver and embroiderer. She has taught English in Beijing and has studied the textiles of China for several years.



Lengths of indigo-dyed fabric dries on rafters in Dong village.

Although synthetic dyes are used in these areas, many women prefer the lasting beauty of the time-honored natural dyeing methods, which use such materials as indigo, oxhide, beans, barks, pig's blood, leaves, egg whites and even red peppers to produce special effects. Requiring sometimes over one hundred steps, cloth is dyed, dried, redyed, beaten, smoked, and steamed in processes which differ from nationality to nationality, and from village to village within the same nationality.

When living in China for nine years, I was able to visit the province of Guizhou over thirty times to document the area's rich display of traditional textile art. I visited the Miao district of Zhouxi many times and lived with a village dyer's family. This family has been in the profession since the 1950s. It carries a certain amount of prestige in the area, and people come from neighboring villages to deliver undyed bolts of handloomed cotton cloth. According to their requests, it is either dyed chemically (a quicker and cheaper process) or dyed in the ancient way. Many women prefer the traditional method, since the results are especially beautiful and never fade.

Traditional dyeing in Zhouxi includes many steps. Between all dippings, from beginning to end, the cloth must be thoroughly dried. First, the white cloth is dipped three times in natural indigo. Then it is immersed eight times in a white liquid made from pressed beans, which seems to help the cloth absorb color. The fabric is again dipped in indigo, three times a day for five days.

Next it is dipped about seven times in a reddish-black liquid made by boiling a wild tree root in water. This blackens the cloth. It is then placed two or three times in a watery-gluey substance made by boiling an ox skin in water. The hide liquid stiffens the cloth and makes it colorfast.

The fabric is dipped once in pig's

blood, which adds a reddish sheen. It is then placed in a wooden bucket and steamed for one hour. This helps make the dye adhere. The fabric is then beaten with a wooden mallet on a large flat stone. Finally it is dipped in indigo again, until the desired effect is achieved.

In this area, it's a common sight to see groups of women down by the stony river bank, dipping their cloth in buckets of dye and then laying long lengths on pebbles to dry under the sun. While the professional dyer is constantly busy dyeing others' cloth, some individuals continue to dye their own. Most households have a huge indigo dye pot for simple indigo dippings.

The dyed fabric is made into festive garments which are further decorated with traditional silk embroidery, silk felt appliqué, fine tin embellishments and decorative weavings. Most families raise silkworms, and the women spin fine silk threads for both embroidery and weaving. Commercial dyes from the market are used to dye the threads in bright colors, but a brilliant yellow is obtained with seeds from a small orangish-yellow pod from a local tree. Put into cold water, the seeds instantly produce a vivid yellow dye which readily adheres to the silk threads. The color lasts for many years, even after repeated washings.

Professional dyers in Zhouxi buy indigo paste from professional indigo growers who live in the Wanchao district, about 50 miles east. Though three kinds of indigo grow wild in the Zhouxi area, the dyers prefer the dependability of the purchased indigo. Over three hundred indigo-producing families live scattered throughout the mountains of Wanchao. Large stone pools hewn from the mountainsides are a common sight there; each pool is capable of holding up to a thousand soaking indigo plants. Indigo paste is sold in local markets and ordered by professional dyers who covet its rich blue

color. Paste from the annual harvest is often stored in leaf-lined baskets, covered with a layer of mud and submerged in fresh spring water.

A Miao group living in Huangping and Kaili counties of Guizhou use a form of what may be gentian violet to color their unique traditional fabric. They spread the dye onto the fabric with a brush, then hold it over a smoldering fire of smoking cypress leaves. Then the cloth is beaten until completely dry. This process is repeated until the cloth turns a brilliant metallic gold. Such fabric is made into festive jackets and finely pleated skirts. The color comes off easily when touched—handling it for several minutes turns your fingers a bright purple-blue.

The starchy root of a terrestrial orchid known locally in Huangping and Kaili as “bing jiu” (*Bletilla striata*) is boiled in water to make a thick liquid used to coat fabrics for several purposes. Some women spread the liquid on the underside of their patterned weavings, to help strengthen the cloth and to keep the threads from unravelling. Likewise, the liquid is brushed onto pleated skirts to help set the pleats.


The Dong nationality live further south, in southeast Guizhou extending down to Guangxi and west to Hunan. In Dong villages, the air vibrates with the constant sound of beating — women beating the warps on their looms, and women beating their finished dyed cloth to perfection. Everywhere lengths of brilliantly dyed cloth hang to dry from carved wooden porches. The dyeing process is basically similar to what has already been described, using combinations of barks, indigo, pig’s blood and leaves, but the Dong include a further ingredient — egg whites.

I visited two women who had spent an entire day pounding long lengths of dark reddish-brown cloth. That night they would spread beaten egg whites onto the

fabric, then steam it for several hours. The resultant cloth shines like glass. Egg-white application is used by a number of Dong dress groups to achieve quite different results. Some Dong apply egg whites to the tight folds of finely pleated skirts. When steamed and dried, the pleating stitches are let loose. The effect is like shining stars; the egg resting on the outer folds reflects light, especially as the wearer moves. In the same area, several Miao groups also employ the egg white method. One particular Miao group mixes egg whites and ground red peppers. When applied to the cloth and steamed, the resultant sheen is a silvery purple-red.

Another group of Miao in this region dress much like the neighboring Dong. What differentiates the two ethnic costumes is a dye-resist decorated cloth made by the Miao. Unlike the wax resist used in other areas of Guizhou, the Miao here use a combination of pig’s fat and the sap from a maple tree. This concoction is used to draw traditional motifs onto leggings, apron yokes, jackets and children’s school bags. After dyeing in indigo, the substance is boiled off and the unique designs appear.

These ancient modes of dyeing are very much alive today in remote mountain valleys and highlands of southwest China. The Miao and Dong people continue to make and wear traditionally dyed garments. But ethnic groups near large cities favor easier-to-care-for Western clothing and fabrics. Such fabrics today make their way even to remote markets. It’s not uncommon to see everyday garments made from polyester blends, though cut in traditional design. Nonetheless, women still prefer to use traditionally dyed fabric for festive costumes. They consider it most precious and beautiful — the perfect backdrop for their exquisite embroideries, weavings and abundant silver jewelry. ❖



THE VEGETABLE-DYED, MUD-MORDANTED SILK OF KUMEJIMA

DOROTHY MILLER

Walking down the streets of Kyoto, Japan, during the Gion Festival in 1957, I admired the women dressed in their kimonos for festival days. Especially appealing were the silk kimonos designed with splashed patterns of color, some designs being birdlike, and others geometrical.

One kimono textile of particular interest to me came from the weavers of Kumejima, an island in the East China Sea near Okinawa. It was dark brown in color with patterns of gold and orange, and was woven from handspun silk. I later saw similar fabric in an exhibition of Okinawan textiles at the Folk Craft Museum in Tokyo, and I sought more information on the dyeing process. I learned that the rich colors are achieved by dyeing the fibers many times in vegetable dyes and mordanting them in a mud bath. The process is called *doro-zome*, which means "mud-dyeing" in Japanese. Finally in 1975 I was able to go to Kumejima to see how this fabric is made.

History

Long ago, the weaving and dyeing of silk was not done solely for the people of Kumejima or for those of the nearby is-

land of Okinawa. Instead, silk textiles were woven to pay the taxes exacted by the feudal lords of the Satsuma clan who governed the islands. The story goes that women were chained to their looms to weave enough cloth to meet the demands of the court. The Satsuma regime controlled their subjects until the early 1900s, when Japan was reorganized under an emperor. When they were freed from feudal taxation, the Kumejima weavers stopped their work and the traditional art began to die out.

Years later, however, the weavers became aware that they could make money by selling their goods in the mainland cities of Kyoto and Tokyo, and cooperatives were formed for marketing Kumejima silk textiles. The weavers went back to work raising silkworms, dyeing fibers and weaving cloth. Interest in these textiles was furthered when Shoji Hamada and Soetsu Yanagi visited Okinawa in 1939. Mr. Yanagi wrote about the crafts of the islands in that part of Japan and Mr. Hamada promoted interest in the crafts through the Folk Art Society of Japan.

Today the making of Kumejima silks can be seen at a weaving studio called Kumeai, where islanders are taught the process. I visited the studio, and also saw weavers at their looms in the village near the Kumeai. On the beachfront road nearby are modern hotels put up for the Japanese tourists.

DOROTHY MILLER has been researching textiles of the Far East for over 30 years. One of her specialties is indigo dyeing, and she is author of the book *Indigo from Seed to Dye* (Aptos, CA, Indigo Press: 1981).

Weavers sell their fabrics through a co-operative, and individual weavers also sell to the buyers from department stores and kimono shops in the cities of Japan. It is hoped that the weavers and dyers will continue to produce these beautiful kimono fabrics. Much depends on whether the younger generation will follow the ways of the older women of the island.

How the Fabrics are Made

The silk used in these kimono fabrics is spun from the outer fibers of waste cocoons. These fibers are removed in a sheet from the cocoon and spread over a type of distaff made for this purpose. They are hand spun into yarn called *tsumugi*, Japanese for "handspun silk," which resembles the tussah silk woven in India. The spun yarn is made into skeins for dyeing.

Dyeing is done at the time of year when the barks and roots are gathered. Plants used for the dark brown include *tikachi* (*Raphiolepis umbellata*), *kuru* (*Dioscorea rhipogonoides*), and *muwagi* (*Myrica rubra*). The yellow comes from *fukuji* (*Garcinia* sp.) and *kurobo* (*Diospyros maritima*). The red and rust colors come from *hachimachiban* (*Carthamus tinctorius*). The dyestuffs are boiled in an iron pot, then the dye liquid is poured off into a separate container and the silk yarns are soaked in this bath. The yarn is dyed repeatedly, as many as 18 to 35 times, in different dye baths, beginning with the lighter-colored dyestuffs and proceeding to the darker dyes.

The mud used for mordanting is gathered from mountain slopes where the soil is particularly rich in iron and manganese. In the past, weavers would place the yarns in natural mud baths, but nowadays the mud is collected and brought to barrels at the dyeing site. Some women wrap their yarns in mud-soaked canvaslike cloths. Others bury the yarns in barrels of mud for two or three days at a time. After the mud treatment, the yarns

PHOTO BY AUTHOR



Silk fibers dry after being overdyed in a kuru dyebath and mud mordanted.

are rinsed and dyed again until the desired rich smoky brown color is achieved.

To make the splash pattern effect in the woven fabric, some of the yarn is dyed with a technique called *ikat* dyeing. To do this, yarn is measured to the length and width of the fabric to be made. Then these measured skeins are wrapped tightly — traditionally with raffia-like straw, but nowadays with plastic tape — wherever a pattern is desired. The wrapping keeps the dye from penetrating, and the wrapped areas end up lighter colored than the rest of the yarn. After the dyeing is completed, the wrappings are removed and the yarn is ready for weaving. The weavers create both warp and weft *ikat* patterns, and also make striped and checked designs. ❖

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NATURAL DYEING IN TURKEY

JENNIE WOOD

A powerful resurgence of interest in natural dyeing began in Turkey during the 1980s, even though the traditional dye recipes and procedures had been abandoned and mostly lost when chemical dyes were introduced at the turn of the century. An important reason for this renewed interest is that Turkey's many-centuries-old tradition of rug weaving never died, and a significant portion of the market is showing its preference for and willingness to pay for rugs in the old colors of plant-dyed wool yarns.

This dyeing renaissance did not begin at the grassroots level with the weavers themselves. Rather, it was initiated by rug collectors and scholars, and is being promoted by several rug dealers who organize the production of oriental carpets and flat-woven kilims. For example, George Jevremovic, owner of Woven Legends in Philadelphia, is a dealer who sells fine old rugs, but he also supports contemporary weavers in eastern Turkey who make pile carpets in traditional designs, using handspun, naturally dyed yarn. In this context, George asked me to go to Turkey in 1988 to help the dyers expand the quantity and improve the

quality of the colors they were getting. I visited dyers in different settings and will describe two of these: Malatya in the east and Ayvacik in the west.

Eastern Turkey is still rather wild and frontierlike, with long distances between towns, steep snow-capped mountains looming over the high plateaus, and vast expanses of dry rocky terrain. Malatya, a city of 250,000 in the southern part of this region, is an agricultural center, the apricot capital of Turkey. There I spent a week working at a dyehouse supervised by Mehmet, a master dyer, whose brother works for George in Istanbul.

The dyeshop is a basement area, approximately 30 feet square, in a building that serves as a warehouse for the carded wool that is supplied to local handspinners and a collection and distribution center for the finished yarns. Three tin-lined copper kettles, each big enough to hold thirty kilos of yarn, sit over gas burners fueled by propane tanks. The kettles are filled with a hose and emptied through valves at the bottom.

I noticed that yarn is never washed before going into the kettles. Skeins are simply put on the floor and hosed down with cold water, then immersed into the hot baths for mordanting or dyeing. When skeins are taken from the dye kettle they are put on the floor and again hosed down with cold water. The sudden

JENNIE WOOD has been studying and practicing natural dyeing for 15 years, with a special interest in ethnic dyes. She works as manager of a wool-spinning mill in Philadelphia, Pennsylvania.

temperature changes result in some felting of the wool, making the bundles of yarn a bit difficult to use, but no one seems to consider this a serious problem.

For most colors, yarn is pre-mordanted with alum at the rate of 15% of the dry weight of the wool (3 kilos of alum for 20 kilos of yarn), and cream of tartar at 5%. This combination is the only mordant I saw used, but the dyers had some iron on hand and were familiar with its use in producing browns and blacks. Mehmet tries to maintain a supply of alum-mordanted yarn ready for the dye-pot. Dyeing is usually done by the simultaneous method: Plant materials and yarns are simmered in the kettle together.

In the southwestern region of Turkey, on the Aegean coast, I visited Ayvacik, a prosperous-looking market town of 10,000 that serves as a commercial center for a number of weaving villages in the area. Several streets in town are lined with small shops that sell yarns, carded wool for spinning, bags of chopped madder root, mordants and kits for indigo dyeing. On Fridays, weavers come to town to sell their carpets to rug dealers, tourists and Turkish retail buyers.

In Ayvacik I worked for several days with Ahmet Balci, a home-based dyer. Ahmet uses two tin-lined copper kettles, each holding approximately five kilos of wool, to dye yarns for his wife and for other weavers in the area. He works outdoors over wood fires, but uses many of the same raw materials and procedures as the more commercial operation in Malatya.

Colors and Dyes

Dyeing for the oriental rug palette concentrates on the three primary colors: yellow, red and blue. There are many plant sources of yellow in Turkey, as there are in most places; the plant chosen for use depends in part on regional differences in flora. On the other hand, almost all the red dyes come from one plant, and

the blues all come from indigo.

YELLOW. I saw three plants used for yellow. First was a spurge, probably *Euphorbia biglandulosa* or *E. peplus*. Its Turkish name translates as "milky," and I can attest to its having a potent milky sap — I picked some along the roadside, later rubbed my eyes and had to go to an emergency room for treatment! In Eastern Turkey, the villages around Malatya gathered the spurge plant and dried it for delivery to the dyehouse. The dyers filled the kettle in layers, adding 15 kilos of alum-mordanted yarn, then a kilo of dried spurge, then more yarn and more spurge. They brought the dyebath to a simmer and cooked it for an hour, obtaining a yellow with a faint greenish cast.

The Malatya dyers used a similar layering procedure with onion skins to produce a slightly warmer and rosier yellow. In Ayvacik, Ahmet used dried blossoms and stalks of some kind of chamomile, probably *Anthemis chia* or *A. tinctoria*, to dye yellow.

RED. It's hard to exaggerate the importance of madder root as a source of reds for the Turkish dyer. The plant, *Rubia tinctorum*, grows wild in Turkey; it has not been cultivated for many years. The Turkish name for madder translates as "root dye." The roots are thoroughly dried, then chopped into small pieces or preferably ground into a powder.

In Malatya, the dyers used coarsely ground madder at the ratio of 25% to 50% of the weight of the yarn. Typically, the madder was not pre-soaked, but was put directly into the dye kettle and simmered for about two hours. Yarn pre-mordanted with 20% alum and 10% tartar was added and simmered for an hour or more, resulting in a dark brick red. Then a batch of unmordanted yarn was added to the same kettle, along with 15% alum and 1% tartar, and simmered for an hour, giving a red-orange. The process was repeated until the madder bath

was exhausted, producing red-orange, yellow-orange and finally two tints of a lovely peach color. For a lovely clear pink, the Malatya dyers dipped unmordanted skeins into a madder dyebath for less than a minute, followed with a dip in a hot alum bath before the final rinsing.

Madder can be used in combination with other plant dyes. Ahmet used it with chamomile to get rosy yellows and salmons, and Mehmet used it with spurge. Combined with walnut hulls and a tannin source like oak galls or acorns, madder gives a variety of warm reddish browns. And madder is occasionally overdyed with indigo to produce purple.

BLUE. The dyers I visited in both eastern and western Turkey used crystalline synthetic indigo, which is chemically identical to natural indigo but much less expensive and more readily available. The Malatya dyers begin by dipping the skeins to be dyed in a hot alum bath. Then they heat the dye kettle to 95 degrees to 105 degrees F and add four ingredients: 1) "Tuxtal," an extract of boiled bones which thickens the bath and helps keep the indigo from settling to the bottom; 2) Sodium hydroxide or lye, which makes the bath alkaline; 3) Sodium hydrosulfite, which removes oxygen from the water; and 4) Indigo. The dyers stir the solution to dissolve the ingredients, wait ten minutes, then add about 30 kilos of yarn, nearly filling the kettle. After nine minutes, the top layers of yarn are removed and hung up to drip. Six minutes later, the second batch is removed, followed fifteen minutes later by the bottom layer, the darkest blue. All the skeins gradually turn bluer as they hang in the air. When the colors seem stable, the yarn is hosed down on the floor with cold water. The result is a wide range of blues with considerable "abrash" or streakiness — an effect that many rug collectors like to see, because it makes a textile seem older and more tribal.

In Ayvacik, Ahmet uses the same ingredients and in approximately the same proportions as in Malatya, but in much smaller quantities. He doesn't start by dipping the yarn in an alum solution, and he puts completely dry yarn into the indigo bath. He leaves skeins in the dyebath for three to five minutes, takes them out to air and dips them again if they are not dark enough. He may repeat the dipping and airing several times, then finally hoses the skeins with cold water. I was surprised that the temperature of his indigo bath was 150 degrees F — so hot that it shouldn't have worked! But Ahmet's indigo skeins have much less "abrash" than those from Malatya, and less tendency for the color to rub off.

Conclusion

As I traveled around Turkey watching both dyers and rug weavers at work, I had to keep reminding myself that there is nothing inherently superior about colors derived from plant or animal sources using traditional methods. I tried to see colors through the eyes of the Turkish women who were working with them, as well as through the eyes of American rug buyers.

Ahmet Balci's wife, Rahime, is a weaver. She showed me rugs that she had made years ago for her dowry, all done with synthetic dyes, as that's all there was available then. The colors are neon-bright, especially the orange. On Rahime's floor was an older, synthetic-colored rug and a newer one done with plant-dyed yarns. She said that she still prefers the brighter rug, but that she was beginning to enjoy the softer colors, and when she weaves for sale, she uses *only* natural dyes. Business, after all, is business. ♦

FURTHER READING:

W. Bruggemann and H. Bohmer. *Rugs of the Peasants and Nomads of Anatolia*. Munich, Germany: Kunst and Antiquitäten, 1983.



A weaver in a west Turkey village with a newly woven traditional rug.

DYEING IN CHINCHERO, PERU

BETTY DAVENPORT

WITH NILDA CALLANAUPA

My love for textiles and wandering along mountain trails has led me several times to Peru, where I can enjoy both at the same time. All throughout the Andes small villages are tucked into high mountain valleys. Here, the people still spin and dye yarn and weave all their traditional clothing. It was during a visit to Chinchero, a village on a high plateau near Cuzco, that I met Nilda Callanaupa.

Although Nilda has a degree in tourism from the University of Cuzco and has a job as a travel agent and trekking guide, she is at heart, first and foremost, a weaver. When she has spare time she takes her backstrap loom and climbs up the hill behind her apartment where she has peace, quiet and a good view over the red tile roofs of Cuzco as she weaves. Every weekend she is back in Chinchero with her parents and sisters, spinning, dyeing, weaving, experimenting and researching the older textile techniques of her people. She spends a lot of time talking with the older women in the village to learn how they used to knit the traditional caps and how they used to dye with plant material. Using

plants to dye wool has been a tradition throughout the Andes for at least 3,000 years and was developed to a very high level of skill. However, since the introduction of aniline dye powder in the late 1800's, the weavers have found it much easier and more time-saving to simply buy the powder at the market to achieve the bright colors they like for their traditional weavings.

One natural dye that has remained very popular throughout the years in Chinchero is *nogal*, a kind of black walnut (*Juglans* sp.). Nilda explains that it is very difficult to achieve the light caramel color that is especially prized for men's ponchos. At least once a year every weaver in Chinchero will dye enough wool with nogal to make one or two ponchos.

Walnut trees do not grow at the 13,000-foot elevation where Chinchero is situated, so the weavers must buy the branches from families down in the Urubamba valley. The color in the leaves is strongest from June to September. When the supply of nogal arrives, the stems, leaves and hulls must be crushed and broken by pounding with a rock or pestle. A huge pot about two feet in diameter is filled with the crushed material and just enough water is added to partially cover them. A small fire is built under the pot and the nogal is cooked for several hours.

BETTY DAVENPORT is a weaver, hiker and mountain climber who lives in Richland, Washington. She leads annual Weaver's Treks in the highlands of Peru.

Nilda's mother, Guadalupe, supervises the dyeing process. Some of the branches are arranged over the top of the cooked mass or across the top of the pot, making a rack on which to lay the wool skeins to hold them above the liquid. The skeins are dipped quickly in the dye liquid and laid on the branches above the steaming caldron. The skeins must be dipped, steamed and turned frequently to obtain an even color. While some are being turned, others are covered with more branches out of the pot in order to catch the steam. If a darker shade is wanted, the skeins can later be left in the warm dye liquid overnight. The dyers take great care to not let the yarn boil in the dye liquid or it will become too brown and too dark. The whole family works together to orchestrate the process. No wonder this is a once-a-year event!

Although the people in the community generally know that plants other than nogal can be used to dye yarns, Nilda hadn't actually seen anyone doing it. When she was in her teens and learning the more advanced weaving designs, she became interested in learning to make dye from plants. She talked to the older women who still remembered how they used to dye yarns and experimented on her own, developing the following dye methods:

Nilda uses a small clay pot and builds a fire under it out of whatever dry branches and stems are available. The fire is small and needs to be stoked often. From experience, she knows just how much water and dye material is needed to dye one skein of yarn. Generally there is a high proportion of dye material to wool so the colors are strong, brilliant and fast. The skein usually consists of two hand spindles' worth of yarn. The yarns from the two spindles are wound together into a skein for dyeing. The plants she uses yield substantive dyes and do not need mordants to fix the color.

One day I was in Chinchero when Nilda's neighbor, Engracia Quispe, was getting ready to dye some yarn a brilliant red with cochineal. Peru is one of the world's sources of cochineal bugs. The bugs grow on the opuntia cactus in several regions north and west of the Department of Cuzco and can be purchased in the markets in Cuzco. Engracia measured out a handful of dried cochineal for her skein of yarn and ground them up with a pestle. She put the ground bugs in a cloth bag and boiled it for about one hour. She then squeezed the juice of about ten Peruvian limes into the pot. The acid of the lime juice shifts the color to bright red; without the lime juice she would get a magenta color. She put the wet wool skein in the dye and cooked it gently for 10-15 minutes. She left the pot on the fire until the fire died out and left the wool in the dye liquid for two days before rinsing it in clear water. The result was a bright carmine red. She could use the dye liquid again several times for lighter colors until it was completely exhausted.

Later as we walked around Chinchero and clambered up and down the Incan terraces on the way to visit the nearby ruins, we saw lots of bright yellow flowers blooming that Nilda calls *kiko*. It is a species of *Bidens* but is often referred to as *coreopsis*. *Kiko* blooms wild around Chinchero from March through June. Nilda explained that she only picks the flower heads and that the color for dye is strongest when the flowers are most plentiful in April and May. She generally uses an equal weight of flowers to wool in order to get a brilliant golden yellow. She adds enough water in the clay pot to cover the flower heads and cooks them for one hour. She leaves the flower heads in the dye when dyeing skeins, but removes them when dyeing fleece. She lets the wool simmer in the dye at least 15 minutes, then lets it cool in the liquid for sev-

eral hours before rinsing in clear water.

Another day as we were having a picnic lunch along the roadside, Nilda pointed out a bushy shrub behind me that had small, shiny oval leaves and lots of one-half-inch-long thorns. This is *ch'ec-chi*, a species of barberry (*Berberis* sp.). Nilda explained that the bright orange root gives a greenish-yellow dye. After lunch we dug up a hunk of the sweet-potatolike root from the rocky soil. Nilda said that it must be used fresh and is best the day it is dug. Back in Chinchero, Nilda mashed the root into small pieces with a pestle and boiled it in water for about 45 minutes. She strained the pieces out of the liquid before adding the skeins. Sometimes she bundles the mashed root in a cloth to contain it and leaves it in the dye pot. She cooked the

wool gently for 10-15 minutes and left it in the dye liquid overnight before rinsing in clear water.

After dyeing, Nilda or her mother will spin the doubled yarns in the reverse direction to ply them, adding a great deal of twist that is needed for their durable warp-faced fabrics. After plying, the yarn is wound into a tight ball and is stored away for a while to allow the twist to set. The dyed yarns are used to weave the colorful designs typical of her village in *ch'umpis* belts, *llijllas* (shoulder cloths) and *k'eperinas* (carrying cloths). Nilda encourages other weavers in her village to carry on the tradition of spinning wool yarn and dyeing it with plant dyes instead of weaving with the brilliant, inexpensive acrylic yarns that are so readily available in the local markets. ❖



Engracia Quispe, Chinchero, Peru, dyes with cochineal.



Indigofera suffruticosa

ELIZA LUCAS PINCKNEY

CULTIVATOR OF INDIGO

MARCIA BONTA

Colonist Eliza Lucas Pinckney loved "the vegetable world extremely," and experimented with growing ginger, cotton, alfalfa and cassava, hoping to bring them "to perfection." But she is most famous for her experiments in indigo culture which she began when she was 17 years old. Through her persistent efforts indigo, which previously had had to be imported by the English from the French West Indies, became a valuable cash crop for the colony of South Carolina.

Born on the island of Antigua in

1722, Eliza was educated in England under the care of her parents' friends. Her father, George Lucas, was a sugar planter and lieutenant colonel in the British Army, stationed in Antigua, but when he inherited three South Carolina plantations from his father, he moved his semi-invalid wife and two daughters to a 600-acre plantation along Wapoo Creek, six miles by water from Charleston and 17 miles overland. From there he also directed the operations of 1,500-acre Garden Hill on the Combahee River, and the 3,000 acres of rice-growing lands he owned along the Waccamaw River. Lucas hoped that the change in climate would help his sickly wife. He also feared the

MARCIA BONTA is a naturalist and writer who lives in Tyrone, Pennsylvania.

Spanish and thought South Carolina might be a safer place to live.

The Lucases had barely begun their new life in South Carolina when, in 1739, hostilities with Spain erupted and Major Lucas was recalled to Antigua, leaving his eldest daughter Eliza in charge of all three plantations. Despite her youth, she was happy in her new, challenging life, following a rigorous daily schedule that appalled many of her more traditionally-minded female neighbors.

Every morning she arose at 5:00 a.m. and read classical writers such as Plutarch, Locke and her particular favorite Virgil whose "calm and pleasing diction about pastoral and gardening" seemed comparable to what she experienced during a South Carolina spring. Two hours later, she walked in the garden, supervising the servants at their work and setting out the tasks for the day. Then she had breakfast followed by an hour of practicing the harpsichord. The rest of the morning she devoted to French, shorthand and teaching her younger sister Polly, as well as two little servant girls, how to read. Dinner was followed by another hour of music and several of needlework and her evenings were occupied by more reading and letter writing.

But her most absorbing work was horticultural — planting a fig orchard, a cedar grove and a "large plantation of oaks," as well as concentrating on making indigo a viable export crop for South Carolinian planters, a project others had tried before her but had not succeeded in. Every year she reported her progress in growing indigo to her father who supplied her with seed. By June of 1741, she was confident of eventual success if he would send seed in time for her to plant it by the latter part of March so the crop would mature before frost.

Her father complied and also sent her Nicholas Cromwell of Montserrat, who was an expert "indigo maker," as the

head man was called, but both he and then his brother purposely spoiled the dye in 1742 and 1743 during the crucial fermentation period — probably because they did not want South Carolina to rival their native island in indigo production. Finally, in 1744, Lucas sent out an unidentified black man from the French Indies to serve as "indigo maker," and the Wapoo plantation produced its first successful dye cakes that year.

To produce indigo, the soil had to be carefully prepared. Once the bushes started growing they had to be watched until the crucial moment, just before blooming, when the leaves were ready to be cut. They were then steeped in large vats of water open to the sun until they fermented and turned the water a greenish color. This fermentation process took several days and was observed around the clock by teams of men directed by the "indigo maker" who never left the premises. When he decided the process was complete, the solution was strained and poured into a second vat, along with a small amount of limewater, where it was beaten with paddles until it began to thicken. This agitation determined the final color of the dye, since the longer the mixture was beaten, the darker the color became. Finally, the solution was put into a third vat and allowed to settle before the clear water was drawn off, leaving a sediment that was formed into dye cakes. After the cakes were carefully dried in the shade, they were ready for market.

While Eliza struggled with indigo production, she continued to send progress reports to her father on other experimental crops — cotton, "Guiney" corn and ginger — all of which had also been "cut off by a frost." In addition, she wrote, the "Lucern [alfalfa] is yet but dwindlering."

Although she liked her solitude, she did accept as many invitations from the Charleston gentry as she could find time for. She was particularly fond of Elizabeth

Pinckney and her niece, who was visiting from England, and of Elizabeth's husband, Charles, who supplied her with books.

Suddenly, in January of 1744, Elizabeth, who had been an invalid for years, died of an enlarged spleen. At the same time, George Lucas, who had been made lieutenant governor of Antigua, sent his son George to Wapoo to bring his wife and daughters back to the West Indies. But, to everyone's surprise, Charles Pinckney quickly proposed to Eliza, and she as quickly accepted. By May of 1744 they were husband and wife, and Eliza entered the most joyful years of her life. Despite the age disparity (he was 45 and she was 22), it was a love match. Charles was a successful lawyer and planter who found time to talk to Eliza about her reading and to join her in her horticultural interests. He also possessed, according to Eliza, "a charming temper and disposition, gay and courteous manners, [was] well-looking, well-educated and of high religious principles."

She moved to Bellmont, the Pinckney plantation, which was only 15 miles from Charleston and overlooked a tributary of the Cooper River, but she, joined by Charles, continued to oversee the cultivation of indigo on both their own and her father's plantations. That summer they gave indigo seed to any planter who promised to raise and export it, and Charles sent six pounds of the blue dye made from the Wapoo crop to South Carolina's London agent, James Crockott, for an expert opinion on its quality. It turned out to be excellent, a worthy substitute for the French West Indies product.

The following year indigo valued at 225 English pounds was exported to London from the Lucas Garden Hill plantation alone. Other planters who had obtained seed from the Pinckneys were equally successful. After that, production of indigo by South Carolina planters skyrocketed. In 1746 135,000 pounds of the

blue dye cakes were shipped to England. Two years later British merchants petitioned the parliament to put a six pence bounty per pound on indigo grown in South Carolina to encourage direct shipping to England. By 1754 217,000 pounds were being exported and careful indigo planters doubled their money every three years. Eliza Lucas Pinckney had fulfilled her primary horticultural goal: to make indigo a profitable crop for South Carolina.

She went on to live a full, long life, most of it in her beloved South Carolina, managing the estates left to her after her husband died of malaria in 1758, always experimenting with new crops and planting new trees. Her two sons also inherited her love of experimenting with horticulture. When the family was caught up in the American Revolution, they never wavered in their support of the patriots, despite strong ties to English friends and to American royalists, and both sons fought in the war on the side of the colonists. Later, Charles Cotesworth Pinckney, who became a prominent lawyer, was sent as one of South Carolina's delegates to the Constitutional Convention in 1787, and Thomas Pinckney became governor of South Carolina. He was also the man who negotiated the Pinckney Treaty with Spain.

No doubt it was the prominence of her sons, and not her own early accomplishments in indigo growing, that prompted George Washington to ask to be a pallbearer at her funeral on May 26, 1793. But historians have not forgotten the role of the young Eliza in the economy of South Carolina. As Edward McCrady later wrote in his *History of South Carolina Under the Royal Government*, "Indigo proved more really beneficial to Carolina than the mines of Mexico or Peru were to Spain...The source of this vast wealth...was the result of an experiment by a mere girl." ❖



An indigo solution is being beaten to oxidize it and turn it blue.



A BLUE FUTURE FOR MEXICAN INDIGO

GARY N. ROSS

Having been born in Louisiana and educated as a field biologist there, I grew up with an indigo heritage. Louisiana once relied on the production and exportation of the dye for its economic survival. As a boy, I saw indigo plants thriving in cattle pastures throughout the state. These plants, I learned, had escaped cultivation more than 100 years earlier and had continually reseeded themselves. My interest in indigo was rekindled years later when, as a collector of textiles in the highlands of southern Mexico, I learned that several Zapotec weavers were still carrying on a tradition of natural indigo dyeing with their tapestry art.

In pursuit of the dye, in the summer of 1982, I consulted several weavers in the Zapotec village of Teotitlan del Valle who used natural indigo to produce a multitude of bluish, greenish and bluish-red hues in their elaborate handmade tapestries and rugs. These weavers did not prepare the dyestuff, called anil, but purchased it at the market town of Tehuantepec in the form of blue chalky cakes.

And so, to further my investigations, I left the dry, mile-high Oaxacan plateau and drove the tortuous mountain road down to the coast and the bustling town of Tehuantepec. There I learned that anil was still grown, but in only one village, Niltpec, which according to Za-

potec legend means "place of the anil plants." Furthermore, I learned that for the last two years only the Tolentino Meza H. family had continued the tradition, selling the entire production from their home to the few weavers who came to purchase it.

Continuing my quest, I easily tracked down Niltpec, two hours southeast of Tehuantepec, and after a few inquiries, I located the Meza family residence. The senior Meza, a short, weather-beaten man of 61, called *maestro* by all, was the expert on indigo production. But Meza's news of his crop that year was not good.

The tiny seeds had been hand-sown in late April at the beginning of the summer rainy season, and they had sprouted on schedule. But the life-giving rains had failed to come, and the plants were small and weak. As I prepared to return to the Oaxacan plateau, we agreed that Meza would contact me if and when he harvested the crop.

Responding to a telegram from Meza, I returned to Niltpec in October. My reunion with the Meza household was affable, but filled with apprehension. The indigo plants were stunted. We headed directly to the fields, where I saw stiff-stemmed shrubs about four to six feet tall, with dull green feathery leaves, and with clusters of small coppery-pink flowers resembling those of pea and bean plants. I

immediately identified them as *Indigofera suffruticosa*, the New World indigo plant, the same as that in my home state.

We sat on the baked earth while Meza explained the sequence of activities that I would soon observe, and that had taken place for as long as he could remember. The onset of flowering, he said, signals the time to harvest — a routine that usually continues on a daily basis for approximately four weeks but that this year would be much shorter. The plants are cut with a pruning knife a few inches above the ground during the hours just before dawn when the sap content in the plants is at its greatest.

The plants are bundled together by the dozen with strips of vine, loaded onto an oxcart and transported to nearby tanks: a set of two open vatlike structures with thick brick-and-cement walls, approximately nine feet square and from four to seven feet deep. Both are built where they will receive the full light of the sun, positioned side by side with a common wall, and with one tank on a sizable mound to allow it to drain easily into the tank below. An adjacent well provides adequate fresh water, which is hauled up by hand and poured into the upper vat.

The bundled indigo plants and water are added to the upper tank until it is one-third to one-half filled, taking about 96 bundles of plants — the complete harvest of one day. Several long wooden poles are jammed across the top of the tank to keep the plants submerged at least six inches below the water's surface, and they are left to steep in the hot tropical sun. During the day, the water warms and the plants' sap bleeds into the water, gradually turning it a light yellow-green. As time passes, air bubbles form among the submerged plants and percolate to the surface — the sign of fermentation. By night, the fluid is so effervescent that the tank sounds like a giant glass of Alka-

Seltzer. Then, near midnight, the solution fizzes out, and a watchman, who has been periodically checking the progress, pulls a plug from the top tank to let the now bluish-green fluid drain into the lower tank. He then goes to the village to awaken two comrades, who return with him for the next stage of the process.

By now the tank has drained. (The spent plants are later given to the town's rummaging pigs as fodder.) The two men take up positions along one side of the lower tank. Each holds, in javelin fashion, a long pole with a shorter cross-piece that forms a T. These poles, or beaters, are forcefully thrust and pulled in unison within the liquid, setting it into violent motion. After five or six hours, sufficient air has been introduced to transform the color of the murky fluid to the intense blue associated with the name indigo. (In chemical terminology, the indigo has become oxidized.) In the process, the human beaters are splashed with the bright stain of blue, marking them with their trade.

The dyestuff next must be separated from the water by sedimentation. This is achieved by adding a concoction of water and the pulverized berries of the *gulabere*, a medium-sized, mulberrylike tree that is common in the area. The tree produces small clusters of small, greenish fruit in August that contain a clear slime. When added to the indigo solution, the mucilage acts as a catalyst and causes tiny flecks of solid blue — indigo dye — to form. Within 15 to 20 minutes, the solution has separated into a clear watery upper layer and a lower one of blue sediment — probably the most beautiful ooze in nature. After the fluid is carefully drained through the tank's escape vent, the one- to two-inch layer of blue sediment is swept from the tank through the same vent, collected in ceramic jugs, and carried off to a nearby shed.

This airy, open-sided, grass-roofed structure is equipped with two wooden racks holding squares of cotton cloth. The blue sediment is slowly poured through a handwoven cane sieve to filter out twigs and pieces of leaves, and into the suspended cloths, which permit the water to drain slowly. By late afternoon the dripping has slowed substantially, and the bags are bound and transported on poles to the security of the owner's open-air patio. Early the next morning the dye, which now has the thick smoothness of freshly prepared pudding, is spread with a wooden spatula onto clay roofing tiles and placed in the sun to dry for eight days. The months of cultivation, the weeks of back-breaking harvest and processing, all are reduced to hard cakes of chalky blue — pure indigo dye.

At least, that was the way the system had worked in the past. The results in this year of drought were still to be seen. The following day, at three o'clock in the morning, we assembled in the first of three small cultivated fields for a projected two weeks of processing. But the cut plants appeared much less succulent than usual, and that afternoon the steeping process proceeded very slowly, not ending until five o'clock the following morning instead of the customary midnight. Also, only three hours of subsequent beating were required to oxidize the solution instead of the usual six or seven.

To further complicate matters, the *gualabere* trees were now, in mid-October, long past their prime, and berries were scarce. An alternative solution from the leaves of a common low-growing weed called *malva* (a kind of mallow) was prepared, but for some unknown reason, it did not work, and the usually clear water that drained from the lower tank into the nearby stream was, instead, an intense blue, leaving behind only a very thin sheet of sediment that at day's end was

contained in two cloth bags. The second day duplicated the first. Time, labor, and potential capital all literally were washing down the drain.

For the next 12 days the procedure was repeated, the outcome always the same. In the end, a paltry 25 pounds of dried dye was the result instead of a typical average of ten times that amount. The value of their month's labor: \$500. We concluded that the plants simply were too dry from the lack of rain during the growing season.

Given this outcome, Meza and his family decided not to plant indigo again and risk further calamities. They would switch entirely to cattle ranching, a proven, stable and profitable occupation for the area. In the spring of 1983, however, the unexpected occurred. Isaac Vasquez, one of the Zapotec master weavers from Teotitlan del Valle, visited the Meza family to convey a plea from his fellow artisans: "Continue to produce indigo and we will pay whatever is necessary; no other source exists except from the foreign market."

New seeds were sown immediately. But once again the rains were inadequate, and the harvest was meager — only slightly greater than in 1982. In 1984 Vasquez petitioned again: once again the fields were planted, and once again the rains failed. By 1985 the total production had hit rock bottom — 11 pounds of dried dye, for which the artisans paid \$600.

And so it goes. Mexican indigo, a unique Zapotec tradition, now teeters on the brink of extinction, remaining alive each year only because a handful of individuals are too proud of their past to concede to what must surely seem the inevitable. ❖

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M A Y O I N D I G O

SUSAN SKIRVIN

For thousands of years, rich blue colors of indigo have been prized by people around the world. The chemical compound which produces indigo blue occurs in several plants of different botanical families. Long ago, dyers living where indigo-bearing plants grow developed methods to extract and use the dye. Inside the plant, indigo pigment is colorless and concentrated in the leaves: A torn leaf turns blue at the edge where pigment reacts with air. This blue will stain but not dye yarn permanently: It doesn't dissolve in water so it stays on the yarn's surface. If the blue indigo pigment is dissolved in an alkaline, chemically reduced solution (one with extra oxygen removed), it makes a yellowish-green dyebath which will dye many types of fibers. The dyer immerses clean, wet yarn in the indigo dyebath and lets it soak thoroughly. When the yarn is first pulled out, there is only a pale yellowish-green color, but as air reaches the fibers and reacts with the dissolved indigo, the yarn turns blue. Repeated dips into the dyebath, each followed by airing, produce deeper blues which are very resistant to fading by light and washing.

I have grown indigo (*Indigofera suffruticosa*) in my backyard. This plant is a tropical bush, in the legume family. I obtained seeds

from a nonprofit seed-conservation organization called Native Seeds/SEARCH, which is dedicated to preserving genetic diversity of crops of native people of the arid Southwest. These tiny black indigo seeds come originally from the Mayo people of southern Sonora and northern Sinaloa in northwestern Mexico, where they live along lowland river valleys and in dry desert areas between valleys. Mayo craftswomen use *Indigofera suffruticosa* and other native plants to dye handspun wool yarns which they weave into thick blankets and rugs. No one knows for certain whether prehistoric people in this area used indigo before the Spanish invasion, but it has been used ever since. Fine old historic Mayo textiles contain both indigo- and aniline-dyed yarns; the aniline dyes have faded badly, while the indigo is still beautiful blue.

The history of Mayo weaving is not as well known as that of the Navajo people in the United States, but probably it followed a similar course: Early settlers and traders bought from the Mayo and encouraged their weavers to keep spinning, dyeing and producing textiles for sale. The completion of the first railroad through Mayo country about 1918 brought many tourists who eagerly bought the colorful blankets. However, by World War II weaving was in a decline which continued to the early 1970's, when only one in twenty blankets contained any vegetable colors.

A revival of plant-dyed blankets was en-

SUSAN SKIRVIN has been using natural dyes for 15 years, teaches and is a graduate student in geoscience.

couraged by interested Americans, including Barney T. Burns of Native Seeds/SEARCH, who buys Mayo blankets to resell in the United States. Mayo weavers said that indigo had become hard to find, since it had grown on sandbars along rivers which had since been dammed. Fortunately, a large indigo bush in the village of La Bocana provided seeds which were collected by Native Seeds/SEARCH and distributed to weavers for them to grow.

As you might expect of a plant coming from tropical riversides, *I. suffruticosa* loves heat and water. To grow it in the hot, dry Arizona desert, I plant pre-soaked seeds in the garden after frost is clearly over, usually in late March or very early April. Young plants need time to develop good root systems before June; then they love the heat, as long as they get plenty of water. By August the plants are nearly four feet tall and starting to bloom, ready to harvest and dye. In Mayo country, frosts are rare and dyers can harvest year-round; in my yard indigo slows down around October and dies with the first killing frost.

The Mayo use a "direct-dye" method to extract pigment and prepare a reduced, alkaline dyebath in one step: Freshly harvested plants are fermented in urine for several days. Fermentation bacteria create reducing conditions, and urea in urine adds necessary alkalinity to dissolve indigo from the soaking plants. Yes, it does smell, but indigo itself has a characteristic strong odor anyway, and this method is simple and straightforward. I tried a variation of direct-dyeing with my indigo plants, using tap water and letting summertime heat do the fermenting. Since my water is alkaline already, I thought it would dissolve the reduced indigo. It did, a little, but the dyebath was blue-green instead of yellow-green and much of the color washed off my yarn. That dyebath was not alkaline enough; I could have added ammonia or

PHOTO: RITA BUCHANAN



The yellow-green color changes to blue when the yarn is exposed to air.

wood ashes to dissolve all the indigo. I still love the colors, though: light sky-blue to medium indigo-blue with a touch of grey on wool, cotton and linen, and a subtle lavender on silk, from three dips and airings. Maybe I'll try the Mayo method next summer, for stronger, clearer blues from the garden. ❖

Special thanks to Barney T. Burns and Mahina Drees of Native Seeds/SEARCH for information on their work with Mayo weavers.

FOR FURTHER READING:

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M U S H R O O M S F O R C O L O R

MIRIAM C. RICE

ILLUSTRATIONS BY DOROTHY BEEBEE



Dermocybe phoeniceus var.
occidentalis

Mushrooms are a reliable organic source of beautiful dye colors — reds, oranges orange-reds, yellows, greens, blues, purples, blue and red-purples, blacks, and tans, grays and browns galore. The subtlety and variety of possible shades is endlessly fascinating, yet a full rainbow can be attained from as few as three or four species. Mushrooms provide beautiful colors which are easy to extract and use, and the colors are washfast and lightfast. Mushroom dyes can be used on protein fibers such as wool, silk, camel hair, llama, alpaca and furs; and on cellulose fibers such as

cotton, rayon, raffia and reed to give colors of varying intensity and effect.

I plunged into exploring and experimenting with mushrooms for dyeing nearly 20 years ago. The excitement of discovery and frenetic recording of hundreds of mushrooms and their colors culminated in the publication of *Let's Try Mushrooms for Color* in 1974. This has sparked interest in more and more countries. (About 70% of mushroom species occur worldwide, so mushroom dyers in different places can easily share their experiences and observations.) *Mushrooms for Color*, the expanded 1980 edition of my book, is the basis for all books on the topic in other languages, including Swedish, Danish, Norwegian, German

MIRIAM C. RICE is the author of the book *Mushrooms for Color*.

and Finnish, and an article in Japanese. Since 1980, five international symposia have provided an opportunity for textile artists, mycologists and mushroom cultivators to exchange ideas and exhibit their work.

A mushroom is the spore-bearing or reproductive part of a fungus organism. Underground, the same organism is made up of a network of threadlike hyphae which grow, spread, digest and store up nutrients derived from the dead leaves, duff, pine needles, old wood and other organic debris in the soil. Now more than ever, fungi are appreciated and recognized for the powerful function they perform in sustaining life as we know it and maintaining the health of the planet as a whole. In particular, mushrooms play a remarkable role in forests. Fungal hyphae interact with tree rootlets to form partnerships called mycorrhizae; these mycorrhizae can be traced throughout the forest floor as scientific proof of the interconnectedness of the whole forest ecosystem. By inoculating seedlings with proper fungal spores in the nursery, small trees when planted have with them the partner that helps obtain minerals from the soil. For example, *Pisolithus tinctorius* has been used for years in reforesting strip-mined areas with lodgepole pine. The same fungus bears fruiting bodies which are an excellent dye source, yielding rich browns to blacks.

Just as mycorrhizal fungi are now cultivated in nurseries, mycologist/cultivators such as Paul and Cruz Stamets, who operate "Fungi Perfecti" in Olympia, Washington, have developed techniques

for cultivating more and more species of edible mushrooms. This research may soon extend to growing the dependable species of dye mushrooms.

Not all mushrooms give color. The common white mushrooms from the grocery store give only tans, beiges and off-whites. For better colors, try wild species gathered from the woods and fields. Learn to identify what you find by studying reference books (see list at end of article), joining

a mycological society or taking a mushroom identification class at a community college, botanic garden or nature center. Learn to recognize the poisonous species and avoid them if you prefer; in any case, remember always to keep your dyeing equipment and materials separate from your cooking and eating activities.

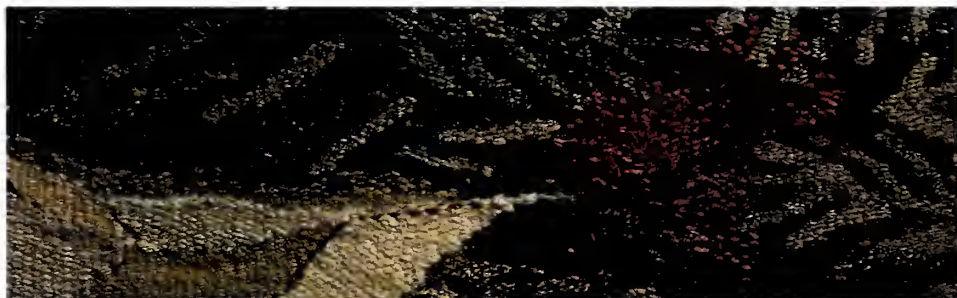
The process of dyeing with mushrooms is the same as with other

natural dyestuffs such as leaves, roots, bark, flowers and berries. To make a dye-bath, simply cover the mushrooms with water, heat to simmering temperature and simmer one hour. You can strain off the liquid before proceeding to dye, or not, as you wish. As a general rule for dyeing wool, start with one pound of natural dyestuff per pound of fiber. However, the amount of pigment in different species of mushrooms varies, so you may need to use more or less to get the color desired.

Premordanting the fiber assures clearer color and more even results. To premordant wool, dissolve the appropriate amount of mordant in water and add to pot with enough water to cover wool, slowly heat to simmering temperature



Sarcodon imbricatum



DERMOCYBE (CORTINARIUS) PHOENICEUS VAR. OCCIDENTALIS

WHEN FOUND: fall to early spring

WHERE FOUND: mixed conifer forest

MORDANT	DRIED	FRESH
None	Apricot	Apricot
Alum	Rose	Wine Red
Chrome	Burgundy	Burgundy
Tin	Red	Blood Red
Copper	Grayed Purple	Grayed Burgundy

SARCODON (HYDNUM) IMBRICATUM

WHEN FOUND: fall

WHERE FOUND: in moist conifer forests or mixed conifer hardwoods
(huckleberry-manzanita)

MORDANT	OVER RIPE/FRESH	DRIED
None	Warm Gray	Gray
Alum	Green-Blue	Gray
Chrome	Gray-Green	Blue-Gray
Tin	Blue	Blue
Copper	Forest Green	Green-Gray

Note: Blue dye only if mushroom is very mature-old, even slimy. No blue from fresh, young mushrooms.

PHAEOLUS SCHWEINITZII

WHEN FOUND: fall and winter

WHERE FOUND: in clusters as a parasite on the ground,
from roots of dead stumps or on live or dying conifers

MORDANT	FRESH NEW GROWTH	FRESH OLD GROWTH
None	Yellow	Burnt Orange
Alum	Yellow-Orange	Burnt Orange
Chrome	Burnt Orange	Red-Brown
Tin	Orange	Red-Brown
Copper	Red-Brown	Red-Brown

and simmer one hour. Remove the wool, rinse it well and use immediately or dry for later use. For color samples, I prepare swatches of six strands of the premordanted yarns, knotting each in such a way as to know at a glance or feel which mordant was used. (I use 0 knots for no mordant, 1 for alum, 2 for chrome, 3 for tin, 4 for copper and 5 for iron.) Having a ready supply of these swatches on hand makes it easy to find out how each new fungal find might reward you when lifted from the simmering brew.

Add the premordanted yarn to the dyebath and simmer one hour. Remove the fiber after the dyebath has cooled, or leave it in the dyebath overnight — this seems to intensify the color and improve the lightfastness. Then rinse the fiber, wash it with soap or detergent, rinse again and hang to dry. Voila! The dyed yarn will not run or bleed.

You can re-use the dyebath by adding more fiber. Mushrooms often contain more than one pigment, so a different color sometimes results from a second dyeing in the same dye bath. The first dyeing depletes one color, leaving the less dominant color to appear. For example, *Sarcodon imbricatum* gives blue in the first dyeing, and brown in subsequent dyeings. Also, the palette supplied by water-soluble fungus pigments is immensely enlarged by using different mordants, mixing different mushrooms, overdyeing and adjusting the pH of the bath. Adding vinegar to reduce the pH of the dyebath, or ammonia to raise it, can produce dramatic color changes. Read books and experiment to learn more about the possibilities of using mushrooms for color.

When all the dye has been extracted, what is there to do with the leftover depleted mushrooms? I use them to make paper. The variety of textures, color and translucency is fabulous. There is mush-

room-dyed paper, and there is paper made from the mushrooms themselves...beautiful, different and with untold possibilities as a source for paper other than our trees. ♦



Detail of "Fragile Flight" tapestry.
Opposite page: Detail from "Forest Floor," another mushroom-dyed tapestry.

PHOTO: T. ELLEN ATHENS

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ARCTIC LICHEN DYES

WENDY CHAMBERS

Lichens are some of the most important colonizing plants, yet some of the least studied. An amateur botanist and dyer can still make exciting discoveries about their distribution patterns or chemical properties. So if the subtle and the inconspicuous draw your attention as they do mine, lichens will offer you a world of wonder. Their varied appearance gives no indication of the riveting colors which they yield to the dedicated dyer.

The first step in dyeing with lichens is learning to identify them by species. (Each species of lichen actually combines two organisms, an alga and a fungus, in a symbiotic union.) Mason Hale's book *How to Know the Lichens* (Wm. C. Brown, Dubuque, Iowa, 1979) is an excellent reference to consult. Basically, lichens are classified into three growth forms: crustose, foliose and fruticose. Crustose lichens grow in a thin layer; foliose lichens have a leaf-like body attached to the substrate by a "rhizome",

and fruticose lichens may be hairlike, shrubby, fingerlike or strap shaped. Lichens are further characterized by various structures which appear on their surfaces. You'll need to use a magnifying glass to distinguish the different kinds of protuberances, pits and other features and to correctly identify a lichen.

Lichens are slow-growing, particularly in the high latitudes where long periods of dayless nights, cold temperatures and lack of moisture limit growth to a few days a year. It has taken thousands of years for the arctic to be colonized by these plants which are now stressed by atmospheric pollutants brought on air currents from industrialized Europe. It's very important for lichen collectors to think about conservation. Don't collect in the same spot more than once in five years; in some areas the interval should be not more than once in a human lifetime. To allow for regeneration, remove less than one-third of the growth. Identify and experiment with a small sample of each new species before collecting in quantity. Try to collect a species only in its most favorable habit where growth is abundant, not where it is rare.

WENDY CHAMBERS lives in Whitehorse, Yukon, where she is proprietor of Down North, a fiber business specializing in musk ox quiviug. She teaches workshops in spinning, weaving, and knitting quiviug; and in lichen dyeing.

By understanding the chemistry of lichens and applying the principles of color theory, you can obtain a satisfying range of colors from the common lichens in a collection area. Each region offers a distinctive palette which can be obtained without endangering rare species.

Dyeing with Lichens

Colors are obtained from the acids contained in the center layer of the thallus, or body, of lichens. Different acids produce characteristic colors. After I have identified a lichen I consult a reference book such as John Thomson's *American Arctic Lichens: The Macrolichens* (Columbia University Press, New York, 1984) to determine which acids are present and to predict which colors the lichen may yield. As some lichens contain more than one acid, they may yield a range of colors with different methods or treatments.

One thing to note is that lichens produce substantive dyes. That is, the color molecules from the lichens can bind to the molecules of protein fibers such as wool or silk without the aid of a metallic salt. This eliminates the mordanting process; in fact, lichens themselves can be used as a mordant with other vegetable dyes.

There are two basic processes for extracting colors from lichens. The first uses boiling water. Clean the lichens of all dirt and foreign vegetable matter, put them in a pot with some yarn and add warm water. Heat the dyebath to a simmer and hold until the desired shade is achieved. Combining the lichen and the fiber in one pot is called contact dyeing. It is messy but yields stronger, clearer colors than cooking the lichen separately, straining off the liquid, and then adding the fiber for further simmering.

Fermentation is the second method of obtaining colors from lichens. It requires

steeping the lichens in ammonia, either full strength or diluted with water, for a period of several days or weeks. This produces the dyes traditionally called orchils, which can impart pinks, fuchsias, and lilac colors to the fibers by processes of cold steeping or hot simmering. With some lichen acids, this process is taken a step further. The yarn is cold soaked for several days until it turns a deep pink, and then, while still damp, exposed to strong sunlight which oxidizes the pink color to blue.

Two supplementary steps can be used to extend the range of colors. First is overdyeing, or dyeing the yarn twice in different dyebaths. Second is shifting the color by adding small quantities of chemical color modifiers to the dyebath, usually at the end of the dyeing process. Copper sulphate will shift yellows to greens, and adding more ammonia will intensify the green or make it mossier. Iron will darken colors and push some tans to darker brown or gray. Acetic acid (vinegar) will shift some orchil pinks to more reddish hues, while washing soda (sodium carbonate) will shift them to more lilac or bluish hues.

One Dyer's Palette

I depend on just a few lichens to produce the primary colors of red, yellow and blue. *Cetraria delisei*, which is very common on the southwestern coast of Banks Island where it grows in large cushions, yields beige to dark brown by the boiling-water method. Using the fermentation method on the same lichen releases an orchil acid which produces a strong fuchsia color that can be shifted to a more reddish tone with acetic acid. This lichen doesn't react strongly to the addition of soda, but *Dactylina arcticum*, another orchil-producing lichen which is abundant in some areas, does react to soda.

Thamnolia subuliformis and *T. vermicu-*



Lichens, clockwise from top left:
Xanthoria, *Cetraria*, *Thamnia*.

PHOTO BY RITA BUCHANAN

laris may appear scattered like thin white worms amongst the other tundra lichens, or may grow in dense mats where each strand is thicker and more branched so that a handful collected looks like a stack of bleached caribou antlers. Using the boiling water method on thamnolias gives colors varying from clear lemon yellow to a warmer, apricot tone. *Cetraria telesii* will dependably produce fluorescent yellows. To obtain blue, I ferment and oxidize *Xanthoria*, a crustose lichen easily recognized by its bright orange color and preference for rocky bird perches.

For the secondary colors — green, orange and purple, I use overdyeing. The photochemical oxidation of *Xanthoria* blue on yarn previously dyed yellow with *Cetraria tilesii* produces a blue-green, while an afterbath of copper sulphate on the same yellow produces a fresh spring green which can be further heightened by adding some ammonia. The same color modifiers on yellow dyed from *Thamnia* produce mossier greens.

For orange, I start with various yellows from *Thamnia* or *Cetraria tilesii*, then overdy with red from fermented *Cetraria delisei*, gradually increasing the strength of the dyebath until I achieve the desired shade. These oranges are very rich apricot and salmon shades.

Purples are obtained from the photochemical oxidation of *Xanthoria* blue

over yarn previously dyed fuchsia with fermented *Cetraria delisei* or *Dactylina arcticum*. An afterbath of soda on the *Dactylina arcticum* produces a lilac shade.

The soft subtle tertiary shades can be achieved by starting with a yarn dyed beige with *Cetraria delisei*. The beige acts as a toner on the overdyed colors. For instance, to make a moss green which is deeper and richer than the one described above, start with beige, overdy with yellow which has been simmered a long time to burnish the color, and then modify it with copper sulphate and ammonia. A lovely old rose can be had by overdyeing *Cetraria delisei* beige with fuchsia from a fermented bath of the same lichen. Smoky gray blues are the result of oxidizing *Xanthoria* on beige, brown or light green yarns.

A lichen collector becomes deeply immersed in the landscape, as it requires keen observation to spot a specific lichen and a thorough understanding of topography to locate the right habitat for each species. This attention to detail extends to the dyeing process. You must understand each lichen's chemistry to coax it to release the colors hidden within. The dyeing process becomes an intimate relationship with the earth which, even in the hilliputian world of lichens, reveals many mysteries to the patient observer. ♦

PHOTO BY MARJORIE HUDSON



Yarns dyed with lichens.

BLUE DYES FROM *XANTHORIA* LICHENS

JUNE UPTON

The xanthorias are foliose lichens of bright orange-yellow hue, which grow on rocks by the sea and on the roofs of farm buildings. The species I use is *X. ectanoides*, which grows on granite rocks on the coast of Cornwall, England. In autumn,

JUNE UPTON is a handspinner and knitter who lives in Helston, Cornwall, England. She has been using natural dyes for nearly 20 years, employing plants and lichens which are plentiful in her area.

older patches of lichen become loose and detached, to be blown away in the first gale — if I don't get there first! I only gather small quantities of loose material, so as not to interfere with the growth pattern. A salty atmosphere and a sunny location produces the best dye material, and while other species of *Xanthoria* also give blue, none are of any use if collected from roofs made of asbestos, perhaps due to its mineral nature.

PHOTOGRAPH BY AUTHOR



Lichen *Xanthoria ectanoides*, United Kingdom.

I follow the recipe given below. Dyers who are familiar with obtaining blue from indigo and woad will note the similarities of gentle heating and the occurrence of a color change (although the dye pigments involved are different compounds). The practice of obtaining a blue dye from this lichen seems to be of recent origin. Dyers who have done historical research into old dyes in the country can find no mention of this technique earlier than Eileen Bolton's *Lichens for Vegetable Dyeing*, published in 1963.

I use this lichen to dye wool fleece which I subsequently spin, but it can be used to dye skeins of wool yarn. The dye also works, but gives softer colors, on cotton and silk. It isn't necessary to pre-mordant the fiber, but using an alum mordant on wool may improve the light-fastness of the dye. This blue dye is best used for articles that are not exposed to much sunlight.

1. Crumble 2 oz. of dried *Xanthoria* lichen into a large glass screw-top jar. Pour in 20 oz. of a solution of 1 part non-sudsy household ammonia to 2 parts water. Cover the jar, and shake it several times daily.

2. After six weeks or longer, transfer the contents of the jar to an enamel or stainless steel pan. Add 1 tbsp. non-iodized salt dissolved in 2 cups of boiling water. Bring to a boil, and simmer for 45 minutes with the lid off the pan. This is best done outdoors, as the boiling drives off the ammonia and causes strong fumes.

Allow to cool, and strain off the liquid.

3. This step must be done on a sunny day. Put the dye liquid into a container large enough to hold 4 oz. of clean fleece, and add sufficient water to fully cover the wool. (Remember that in natural dyeing, success depends on the ability of the fiber to take up the dye, not on the dilution of the dyebath.) Stand the container in a bucket filled with boiling water. After 30 minutes, remove the wool to check its color — it should be a strong, "shocking" pink! Squeeze out the fleece and spread it out in a clear plastic bag. Don't allow it to dry yet.

Put the bag in a warm place exposed to sunlight. I find the best place is indoors on a sunny windowsill, and use a shiny metal tray under the bag as a reflector. When one side of the wool is "done," turn the bag over. The fleece may be dipped in the dye and blued in the sun several times for a deeper shade. When the color is deep enough, or the dyepot is exhausted, allow the wool to dry out of sunlight. When it is completely dry, wash in cool soapy water and rinse, adding 1 tbsp. of salt to the final rinse.

NOTE: Lichen pieces left over from the fermentation may be boiled with fresh water to give a dusky pink on chrome-mordanted wool. My family calls *Xanthoria* "Auntie's Magic Lichen," a name that originated when I was teaching my niece about plant dyeing. We discovered that this lichen reacts instantly to pH changes — going alternately pink (with alkali) and yellow (with acid). ❖

DYEING 1750'S BRITISH REDCOAT UNIFORMS

JIM LILES

During the French and Indian War (1754-1763) the British Colony of South Carolina felt threatened by French activities in the Mississippi Valley. To counter this threat the Colony formed and sent The Independent Company of South Carolina (approximately 100 soldiers) to build and garrison Fort Loudoun, in the heart of the Overhill Cherokee Indian nation. The purpose was to reinforce the allegiance of the Cherokee with the British and to maintain trade between the Cherokees and the Colony of South Carolina. Thus, Fort Loudoun became the westernmost British outpost in the Southern American Colonies. The recreated fort, on its original location, lies on the Little Tennessee River (now Tellico Lake), about 40 miles southeast of Knoxville, Tennessee.

In 1985, a small group of living history re-enactors, including myself, decided to recreate the Independent Company and conduct a living history program. Being a natural dyer and having worked extensively with piece goods, I volunteered to

dye the material for at least some of the uniforms, using methods to the best of my knowledge comparable to British dye-houses of the period. Research dictated madder-red wool breeches, waistcoat and regimental coat for Privates and Corporals, with "Popinger green" cuffs and facings on the coat. "Popinger green" was determined to be popinjay or parakeet green, a light yellow-green. Officers' uniforms were similar, except that cochineal scarlet was used instead of madder red. Also, the Drum Sergeant-Major's uniform called for reversal of the colors on the regimental coat, i.e., popinger green body with scarlet cuffs and facings, and a most handsome tall embroidered miter cap of green and scarlet instead of a black tricorne. Finally, heavy brown linen gaiters completed the outfits. Originally, these were painted with a mixture of linseed oil and burnt umber. Instead, I decided to dye mine dark Indian cutch brown to reduce stiffness and mess.

I elected to do my Private's uniform first. I had on hand proven good-quality madder roots from Alliance Imports for the red. The "popinger green" would have resulted from dyeing woolen cloth light indigo blue in a fermentation vat, alum-tartar mordanting the blue cloth and overdyeing with weld or old fustic yellow. Fortunately, I had natural indigo,

JIM LILES is a Professor of Zoology at The University of Tennessee in Knoxville, whose research interests include traditional dye technology and history. His book *The Art and Craft of Natural Dyeing: Traditional Recipes for Modern Use* will be published by the University of Tennessee Press in late 1990.

purchased by my wife from Skilbeck Bros. of London in 1964. This family firm served as purveyors of the finest natural dyestuffs in the world from 1650 to about 1970. I also had plenty of old fustic (a tropical dye wood).

The next step involved procuring suitable 100 percent woolen cloth, about 10 oz./yard. This is ideal weight for sewing, particularly since the entire outfit would be linen lined. Good quality woolen cloth costs \$10-20 per yard, and 5 to 6-1/2 yards are required, depending upon the size of the man. Thus, a reasonable outlay would be required for the undyed wool alone. Such a situation dictates running test samples. I knew my dyestuffs and mordant chemicals to be good, but would a selected cloth dye evenly and without spots, and would it dye a nice madder red rather than a reddish-orange or brick color? Also, how much madder would be optimum, and how much mordant?

Dyeing the Cloth

Dyeing piece goods presents some problems compared to dyeing fleece or yarn. One factor is the volume of fluid needed. I allow 4-1/2 to 5 gallons per pound of fleece or yarn, but prefer at least 6 to 8 gallons per pound of fabric. (Otherwise, the dyeing is likely to be uneven.) The additional volume dictates a large pot for mordanting and dyeing; I have both 12-gallon and 30-gallon vessels. A 3 yard (equals 3 lbs.) piece of fabric is about as large as my dyeing vessels, heat source, washing sinks and drying table can accommodate. Also, compared to a skein of yarn, a 3-yard piece of dripping-wet woolen cloth, 58 inches wide, is a rather formidable object! It's all I can handle.

A 3-yard piece is sufficient for the breeches and waistcoat for an average-to large-sized man, but an additional 3-yard piece is necessary for the regimental coat and fatigue hat. (A fatigue hat was worn during work detail; with green rim, red

body and red and green tassel, it somewhat resembles an elf's Christmas hat.) Therefore, scouring, mordanting and dyeing had to be done twice for each uniform, using methods as identical as possible in both cases — same batch and amount of mordant and madder, same dyeing time, etc. I dyed the cloth for other mens' uniforms in my 30-gallon stainless steel vessel, but made an exception for my own uniform. Since I am quite small, only 2 yards was needed for my regimental coat, 1 yard for the waistcoat, and 1-1/2 yards for the breeches and fatigue hat. I used my 18th-century 12-gallon copper dyeing vessel in this case, but had to do the madder dyeing three times. Some would consider this going beyond the call for strict adherence to authenticity.

By sampling, I determined that the best results were obtained by premordanting the woolen fabric with 4 oz. alum and 1 oz. cream of tartar per pound of wool, followed by dyeing with 8 oz. madder roots per pound of wool. During the dyeing, I manipulated the fabric almost continuously, repeatedly turning and unfolding it so that it would dye evenly. Piece goods always require much more handling than is the case with yarn or fleece. To prevent spotting, I am careful never to permit piece goods to cool in any dyebath.

Dyeing the popinger green proved to be rather difficult. At first I had beginner's luck with respect to depth of the indigo blue and strength of fustic yellow overdyer, but it was hard to match the color for subsequent uniforms. One would wonder why a light yellow-green would have been used. Such greens are prone to fade with exposure to light, though I must confess that the color is quite attractive with either madder red or cochineal scarlet. Two possibilities come to mind. One is that more durable, darker greens may have already been in use by other regiments. The other is that the regimental



Miter cap — cochineal, scarlet and popinger green.

PHOTO BY DALE LILES

coat was replaced each year. The first year the soldier was outfitted completely; the second and subsequent years he received one new shirt, neckstock, and pair of shoes, as well as a new regimental coat and pair of breeches. The old regimental coat was then cut down into a replacement waistcoat, sleeved or sleeveless, but in any event the green facings and cuffs were discarded. I attempted to make the green a bit more fade-resistant by adding a small amount of copper sulphate after-mordant to the yellow dyebath near the end of the dyeing cycle. This precaution helps, and while I was not particularly worried about my own facings and cuffs, I was considerably concerned about the Drum Sergeant-Major's regimental coat, predominantly colored popinger green.

Dyeing the heavy linen for the gaiters cutch brown presented no problem. The tricks here are not to add the material to the hot cutch bath until all dyestuff is completely dissolved, and to finish the dyeing in the hot (170-190 degrees F) dyebath. Permitting dyed piece goods to

cool in a cutch bath is particularly disastrous since catechin, one of the two dyes in cutch, is soluble only in hot water.

This concluded the dyeing for my Private's uniform. Dyeing cochineal scarlet for the officers' uniforms took a bit more effort than necessary as I adhered strictly to 1750's methods. This involved making the mordant (tin or red scarlet spirits) from feathered (powdered) tin, and a combination of hydrochloric and nitric acids and water. The dyeing was one-pot, using the tin spirits and tartar, along with 1 oz. of ground cochineal and a touch of turmeric per pound of wool.

Each member of our group practices a craft occupation, just as the original Independent Company did. One couple are leather workers. Others make our handsome cowbag knapsacks and linen haversacks. Our Drum Sergeant-Major is a pewterer, molding the many buttons for our uniforms, as well as spoons and other utensils. He also conducts Sunday morning services; quite appropriately, he is Episcopalian. ❖

MAKING A TENNESSEE HERITAGE SAMPLER QUILT

JIM LILES

When I started researching pre-synthetic-era dyes, one of the first things that caught my attention was the fact that the majority of 18th and 19th century dye manuals contain as many or more recipes for cotton and linen as for wool or silk. By contrast, the natural dyeing of cotton and linen has been largely neglected in the 20th century. Therefore, I chose to concentrate my efforts on these fibers, using and modifying recipes I found in the old dye manuals, and I have been richly rewarded with

beautiful colors. Although the processes are generally more involved, time consuming and expensive than with wool, cotton without question has become my favorite fiber to dye.

Cotton is the major fabric of quilters, and by 1984 most of my natural dyeing was being done on cotton sateen and print cloth in pieces 1 to 2-1/2 yards long. Increasingly, I wished to see my dyed fabric in a quilt rather than piled up in boxes, so I approached the "Thursday Bee" of the Smoky Mountain Quilters of Knoxville and Oak Ridge,

Tennessee, with a proposition. Would members of the bee be interested in making a quilt of my fabrics? The response was most gratifying, and within two months a plan was formulated to produce a Tennessee Heritage sampler quilt, similar to those of the period from 1830 to 1870. The restrictions were that the quilt block patterns had to be those found in Tennessee quilts made prior to 1930, but the blocks could be of varying size and of any color combination.

Our goals in this project were several. We wanted to show how such a quilt would have looked, newly made. A few of the dyes, such as indigo, Turkey red, black oak bark yellow, chrome green and anti-mony orange are remarkably lightfast and appear very much the same in an old quilt as in one newly made. Many others however, fade at least somewhat. The quilt would show that the natural dyes of our ancestors were not always sombre and muted, but also bright and vibrant, though with a distinct softness. Bright, vibrant colors were highly desired for dark cabins or houses illuminated by candle-light or coal oil lamps. It would also demonstrate that natural dyes, premixed by nature, present a different and often more pleasing visual effect than do many of our highly pure modern synthetic dyes.

The quilt illustrates the range of colors possible and in use by 1830. Beautifully colored fabrics were available to those who could afford them and those with the expertise to dye their own. By 1800, the use of the traditional cotton dyes had reached the peak of its perfection; by 1830 several additional mineral dyes were available and cochineal was in use by the calico printers. Thus, a full array of plant-derived, animal-derived and mineral dyes were in use.

A final goal for this project was to recreate the quilting experience of our ancestors. We decided that the quilt

would be entirely hand sewn, and my wife Dale would hand card the cotton batting, as in the originals. Working on the quilt gave us a much closer feeling and appreciation for the problems of our quilting ancestors. For example, quilting through unsoured cotton batting proved to be a pleasure because the traces of cottonseed oil and wax serve as a natural lubricant. Conversely, quilting through dense mineral-dyed fabrics resulted in sore and pricked fingers, a frustration for all. Quilting stitches had to be close, because a quilt filled with traditional cotton batting becomes lumpy upon washing if the quilting stitches are farther apart than the short length of the cotton fibers.

In all I dyed approximately 120 colors, tints, shades and intensities; one square yard being the smallest quantity of each. Often the same dye can provide several colors or intensities of color. For example, Bemis (1815) listed 13 shades of indigo blue. Madder gives pink, red, purple, brownish-purple, gray, black and reddish-brown, depending on mordant combination and dyeing procedure. Madder with black oak bark yellow results in an array of oranges; madder with indigo gives purple.

I selected dyes exhibiting the greatest color range, while having the best reputations for light- and wash-fastness. I used no brazilwood or logwood reds since these fade to a rather ugly brown or pink-purple. Other rather fugitive dyes were used sparingly. Upon completion each block was placed on a wall in the workroom, illuminated by fluorescent lights, until the project was completed. Some of the first blocks were up for a period of two years, long enough to detect any fading dyes. By now the quilt has been under strong lights in four exhibits, a duration of five to six months, and fading has been minimal.

DYES USED IN THE QUILT

REDS AND PINKS: Madder, madder and black oak bark, Turkey red, cochineal and coreopsis.

ORANGES: Madder and black oak bark, coreopsis, chrome, iron buff.

YELLOWs: Black oak bark, goldenrod, chrome, iron buff.

GREENs: Indigo and goldenrod, indigo and chrome yellow, Prussian blue and chrome yellow, Prussian blue and old fustic, logwood and old fustic.

BLUES: Indigo, indigo and cochineal,

indigo and iron tannate, Prussian blue, Prussian blue and logwood, Prussian blue and safflower, Amish logwood.

PURPLEs: Madder, cochineal, logwood.

BROWNS: Bombay cutch, cutch and osage orange, osage orange and logwood, cutch and walnut, coreopsis and tannin, mineral khaki, manganese bronze.

GRAYS AND BLACKs: Iron tannate, iron tannate and mountain laurel, iron tannate and logwood, Prussian blue and mountain laurel, logwood, madder and black oak bark. ❖



This sampler quilt is made of cotton using traditional dyes.

PHOTO BY DALE LILES



Cochineal and indigo produce a wide range of colors.

PHOTOS BY AUTHOR

USING COCHINEAL AND INDIGO IN DYE COMBINATIONS

TRUDY VAN STRALEN

I dye hundreds of pounds of wool, mohair and silk fibers and yarns each year with natural dyestuffs. To get the widest range of colors at a reasonable cost, I often combine expensive exotic dyestuffs such as cochineal

TRUDY VAN STRALEN *lives in rural eastern Ontario, Canada. She has been working with natural dyes for 15 years, and sells vegetal-dyed fleece and yarn to handspinners and weavers.*

and indigo with local dyes — any of the plants growing nearby which give yellows and browns. I'll share some of my recipes in this article.

I like to work by percentages so I use the metric system for weights and measures. Don't let this scare you — people who participate in my dye workshops soon adjust to metric measures, and you can too. Increased accuracy is another

advantage to working this way. If you're careful about weighing the fiber and dyestuff on a gram balance, you can repeat recipes consistently. By contrast, if you work with teaspoons and cups you can easily be off by 10% to 20%, which makes noticeable differences in the results.

For each of the recipes below, be sure the fiber is warm and wet when adding it to a dyebath. After dyeing, wash the fiber and rinse it well before drying.

Using Cochineal

Cochineal alone gives a bright red. I also use it in combinations as a way to "warm" other colors. It's very expensive, but a little goes a long way. To get the most color out of every bug, I use a coffee mill to grind the cochineal into powder as fine as the finest melitta coffee.

No mordanting is required to make the color fast, but premordanting with alum or tin gives deeper colors and makes the supply of cochineal last longer. To mordant 100 gr. of fiber for cochineal and cochineal combinations, use 10% (=10 gr.) alum plus 5% (=5 gr.) tartaric acid; or 1/2% (=1/2 gr.) tin plus 5% (=5 gr.) tartaric acid. (Using the tartaric acid in combination with the alum or tin helps soften the yarn.) Mix the mordant with 4 litres of water, add the fiber and simmer for one hour.

1. BRIGHT RED FROM COCHINEAL. For 100 gr. tin-mordanted wool, use 10 gr. cochineal, and 5 gr. tartaric acid. Soak the cochineal and tartaric acid in a stainless steel or enamel dyepot overnight with 4 liters of water. In the morning bring the pot to a rolling boil and let boil for 15 minutes. There will be a foam on the surface that includes all the little particles of cochineal. Take some waste fleece and stir it around in the pot to catch all the residue. The dyebath is now ready for dyeing. Put the fiber into the

pot and simmer for 30 minutes.

2. SOFT RASPBERRY FROM COCHINEAL AND BRAZILWOOD. For 100 gr. of wool, use 30 gr. brazilwood, and 3 gr. cochineal. Put the brazilwood chips in an old nylon stocking, combine with the cochineal in 4 liters of water and soak overnight. In the morning bring the pot to a boil and boil for one hour. Remove the brazilwood and use waste fleece to skim off the foam. Put the fiber into the pot and simmer for one hour.

3. WARM BROWN FROM COCHINEAL AND BLACK WALNUT. For 100 gr. of wool, use 500 gr. black walnut hulls, and 4 gr. cochineal. Cover the black walnut hulls with 4 liters of water and boil vigorously for 90 minutes. Strain off the liquid and add enough water to make a 4-liter dyebath. Add the cochineal and simmer an additional 15 minutes. Put the fiber into the pot and simmer for 90 minutes. The fiber will take on the cochineal color first, but needs the full 90 minutes to get the most out of the black walnut. This dyebath can be reused with an additional 100 gr. of wool for a lighter shade of brown.

4. WARM ORANGE FROM COCHINEAL AND MARIGOLD. For 100 gr. of wool, use 400 gr. fresh marigolds, 3 gr. cochineal, and 5 gr. tartaric acid. Soak the marigolds overnight in 4 liters of water, and soak the cochineal and tartaric acid overnight in a small jar of water. In the morning, boil the marigolds for one hour then strain off the liquid. Add the cochineal solution and enough water to make a 4-liter dyebath. Boil for 15 minutes. Put the fiber into the pot and simmer for one hour.

Using Saxon Blue Indigo

This is not a traditional method of using indigo. Instead, it is an old industrial recipe, used in Europe just before chemical dyes were discovered. Compared to

dyes from an indigo vat, this method gives a more royal blue color with neutral water and a more turquoise color with acid water. The recipe involves making a concentrated solution of dye liquid, which is then used a few drops at a time.

1. MAKING THE SAXON BLUE SOLUTION. This should be done outdoors, with proper tools and protective clothing — a rubber apron, rubber gloves and safety goggles. Measure 14 gr. indigo and 7 gr. calcium carbonate and put them in a large glass jar. Carefully measure 90 gr. sulphuric acid into a separate container. Add a little of the sulphuric acid to the indigo and calcium carbonate while stirring with a glass rod. Repeat, adding just a little at a time. Then stir once a day for the next 14 days. After that the solution is ready to be used. Label the jar, fasten its lid securely and keep it out of the reach of children. This solution won't spoil and keeps for years.

2. DYEING WOOL WITH SAXON BLUE. Add 1 ml to 3 ml indigo to 4 liters of warm water and stir. Add 100 gr. warm, wetted, unmordanted wool. Simmer for 30 minutes.

3. AQUA-TURQUOISE FROM INDIGO AND QUEEN-ANNE'S LACE. For 100 gr. alum-mordanted wool, measure 200 gr. Queen-Anne's lace (or use another local plant which gives a yellow dye). Cover the plants with 4 liters of water and simmer for one hour. Strain off the dyebath,

add the wool and simmer for 30 minutes. Lift wool out of bath and add 2 ml Saxon blue indigo solution. Stir. Put the wool back into the bath and simmer for another 30 minutes.

4. FOREST GREEN FROM INDIGO AND CUTCH. For 100 gr. of wool, measure out 20 gr. of *cutch* extract and dissolve it in 4 liters of hot water. Add the wool and simmer for 45 minutes. Lift wool out of bath and add 4 ml of Saxon blue indigo solution. Stir. Put the wool back into the bath and simmer for another 45 minutes. This recipe can be used on unmordanted wool, or with different mordants to obtain different shades of green.

5. PURPLE FROM COCHINEAL AND INDIGO. Soak 5 gr. cochineal and 5 gr. tartaric acid in 4 liters of water overnight. In the morning heat and simmer for 30 minutes. Add 100 gr. tin-mordanted wool to dyebath and simmer for 15 minutes. Lift wool out of bath and add 3 ml indigo solution. Stir. Put the wool back into the bath and simmer for another 30 minutes. For brighter purple: Put the wool in a pail of hot water with 50 ml non-sudsy ammonia. Wash and rinse well.

6. DARK BLUE FROM COCHINEAL AND INDIGO. Prepare the cochineal dyebath as directed for purple, but use alum-mordanted wool. Using 3 ml of indigo solution gives a dark blue. For a lighter blue, use just 1-1/2 ml indigo. ❖



DYEING WITH WEEDS

ANNE BLISS

Natural dyers looking for reliable, cheap, readily available dyestuffs will find a treasure for their pots in vacant lots, along roadsides and in their own backyards. What those dyers will find are weeds that generously supply fast colors. Weeds belong to numerous plant groups, but they all share the characteristic of growing where they aren't wanted.

Weeds are quite successful at doing just what plants are supposed to do: adapt, grow and multiply. Humans don't have to plant their seeds, make cuttings, water or feed these plants to get them to thrive. Weeds do the work all by themselves, though many species seem to appreciate a farmer who breaks new ground or a homeowner who ignores a portion of the lot; it's in those open, idle grounds that weeds most often settle.

Weeds thrive around humans, or perhaps we should say that humans historically have made life easier for weeds. Ancient nomads, who moved frequently, transported seeds and dropped them along the way. We and our pets do the same thing today when we go hiking and

come home with socks full of seeds. Early agriculturalists enabled certain plants to spread into broken or tilled soil; the disturbed ground, bared of native flora, allowed "immigrant" species to gain a foothold. In the mid-19th century, seed from Eurasia, imported for grain fields, contained errant weed seeds. As a result, a number of Eurasian "grain crop weeds" such as Russian thistle (*Salsola kali*) were introduced. These weeds have spread rapidly across North America and have naturalized in areas where they could adapt to soil and climatic conditions.

We can sort weeds into the 3 "N" categories: native, naturalized and noxious. Native species have been growing in the locale in which we find them since "who knows when." They came with the territory. Naturalized weeds are those introduced species that either were planted by mistake, as Russian thistle, or escaped from a purposeful planting. In general, naturalized weeds tend to interfere more in agriculture than native weeds and to create more problems as a result of that interference. The third category, noxious weeds, includes both native and naturalized plant species. Noxious weeds are so labeled by the U.S. Department of Agriculture because they severely deplete the soil of valuable nutrients, poi-

ANNE BLISS is the author of *A Handbook of Dyes from Natural Materials* and a field guide entitled *North American Dye Plants*.

son animals, or generally cause extensive agricultural damage and economic loss. The law forbids growing, selling or propagating noxious weeds.

Although only ten weedy plant species are discussed here, thousands more are available. Some weeds that produce wonderful, but not always fast,

colors are localized in certain parts of North America. An example is pokeweed or pokeberry (*Phytolacca americana*), which produces lovely but fugitive cranberry-reds, violets and oranges. Weeds, like non-weedy species, have relatives that generally produce similar colors. If one species isn't available in your area, try a relative. Plants discussed here, however, are tough, common, widespread pests that can be found over most of the United States, Northern Mexico and Southern Canada.

If you aren't sure about identifying plants or knowing whether or not the species you find are weeds, order a copy of my favorite reference on North American weeds: *Common Weeds of the United States* published by the U.S. Department of Agriculture (1971) and available in paperback from Dover Publications, Inc. in New York.

The colors produced by the plants described here appear quite similar at first glance. No wonder ancient dyers got excited about indigo blue or the cochineal insect and its red dye; our ancestors also got the golds, yellows, and olive colors you see here from "local" plants. By manipulating picking time (before or after blooming, before or after rain) and time in the bath (1

PHOTOGRAPH BY AUTHOR



Dyes from the weeds in the bouquet above were used to color the surrounding yarns.

hour more or less followed by cooling or fermenting for as long as you like), you can produce lighter colors, yellow instead of brass, and so forth. Experimentation and record keeping are keys to colors and success; bear in mind that water and soil conditions (acidic, alkaline, predominant minerals) can

affect your color outcome.

These ten weeds were used in a simple pre-mordant and dye method that you can adapt to your own facilities and needs. Use rubber gloves, a face mask, and good laboratory procedures when working with mordants and dyes. Have good ventilation, and dispose of exhaust baths safely. Store mordants away from children and unsuspecting adults; label mordants as poisons. Use common sense in your weed gathering; skip those with known toxicity to humans (e.g., poison ivy) and those to which you're allergic (or use a ventilator mask that filters the air you breathe).

Here's my simple "test" method; you can vary amounts once you get a benchmark reading.

MORDANT: Per 1 pound of dry weight clean wool use 4 gallons of water in a non-reactive pot with lid. Add mordant choices to water and stir to dissolve:

Alum: Potassium aluminum sulphate: 4 tablespoons (64 grams)

Chrome: Potassium dichromate or bichromate: 3 teaspoons (20 grams)

Copper: Copper sulphate: 2 tablespoons (42 grams)

Tin: Stannous chloride: 2 teaspoons (12 grams)

Iron: Ferrous sulphate: 2 tablespoons (27 grams)

Enter well-wetted wool (soaked in like temperature water for 30 minutes); bring to simmer and maintain temperature at least 1 hour. (Optional: Cool yarn in mordant bath.)

Remove yarn and rinse 3 times (more if water is not clear).

DYE: Per 1 pound of dry weight clean wool use 4 gallons of water in a non-reactive pot with lid. Add 1 pound of fresh plant to water (1:1 plant to wool ratio); you can adjust the 1:1 ratio after a test (use more plant to get deeper colors, less for lighter). If you chop the plant, pigment acids will release faster into the water. Bring to simmer and maintain the temperature at least 1 hour. (Optional: Cool plant in bath overnight.) Strain out dyestuff. Add premordanted, rinsed wool (same temperature as dyebath to avoid shocking the wool) and bring to a simmer. Maintain the temperature for 1 hour. (Optional: Cool yarn in bath.) Drain; rinse yarn in clear water until water indicates no further bleeding; i.e., until the rinse water remains clear. Dry, under even tension, out of direct light.

Allowing wool or dyestuff to remain in cooling baths often produces better wash- and lightfastness than rinsing immediately after the 1 hour simmer. Note that colors tend to darken during the cooling period. The colors listed below were recorded after cooling. Each color was lightfastness-tested in bright Colorado sunlight (5,400 feet) for 50 hours, and fading or change in coloration was noted.

Bindweed

(*CONVOLVULUS ARVENSIS*)

This weed was introduced from Eurasia and became a bane of North American gardeners, but a delight to dyers who find the excellent fastness and color range easy to accept. Bindweed is a

perennial, with spreading roots that may grow down 20 feet, as well as a bountiful seed crop following pretty white or pinkish morning-glory blossoms. Use as much of this noxious weed as you like, for by pulling on the vines, you'll break the roots, which in turn magically send up multiple shoots (more dye!). Flowering vines with leaves gave these colors in mid-summer: No mordant — light yellow; Alum — yellow; Chrome — bright gold; Copper — greenish gold; Tin — Yellow; Iron — olive.

Fastness: no visible fading.

Cocklebur

(*XANTHIUM ITALICUM* AND OTHER SPECIES)

This rough-to-the-touch, tough annual weed produces small yellowish flowers followed by hard brown seed burs that give the plant its name. After an introduction from Eurasia, cockleburs have spread from coast to coast, except for a small area from upstate New York east to the southern tip of Maine (Beware, they're headed your way!). The genus *Xanthium* contains several species, varying more in the characteristics of the burs than in dye colors. Some cocklebur plants grow to be 5 feet tall, so one plant may fill your dyepot. If you live in an area with livestock, make a lot of cocklebur dye because the seedlings are poisonous to the stock. Early August's greenish burs, leaves and stems gave these colors: No mordant — light brass; Alum — brass; Chrome — brass; Copper — light greenish gold; Tin — brass; Iron — dark olive green.

Fastness: no visible fading; iron turned slightly browner

Dogbane

(*APOCYNUM CANNABINUM*,
A. ANDROSAEMIFOLIUM)

Dogbane is poisonous to cattle but has historic importance to several Native American groups who used the stem

fibers for basketry; another common name for dogbane is Indian Hemp. Look for dogbane in damp soils, along roads and railroad tracks and at the edge of the forest. The spring flowers are tiny, greenish-white 5-petaled blossoms that develop into interesting, slim pods full of tiny parachute seeds. Although dogbane is a reliable colorist, be careful to wear gloves. The milky white fluid in the stems may irritate your skin. August's stems, leaves, flowers, and pods gave these results: No mordant — brass; Alum — bright brass; Chrome — brass; Copper — brassy khaki; Tin — brighter brass than alum; Iron — dark brown-green.

Fastness: very slight fading (alum, copper) and slight dulling (tin, iron); only chrome and no mordant showed no change. All were fast to washing.

Dock, Curly Dock (*RUMEX CRISPUS*)

Another introduced weed from Eurasia, curly dock, has spread throughout the U.S., Canada and into Mexico. (Some other dock species are native to the U.S.) In some areas this 3-feet-tall, wavy-leaved plant with a large yellowish taproot is classed as noxious. Even though the oxalates contained in the leaves have been known to cause problems for grazing animals, many people consider the young leaves with their slightly sour taste to be superior potherbs. The rust-brown seeds have been widely used as a grain among various Native American groups. Green leaves, stems and early seeds produced these colors: No mordant — brass; Alum — brass; Chrome — brass; Copper — khaki; Tin — bright brass; Iron — dark olive.

Fastness: no visible fading; tin turned slightly pinkish.

Goldenrod (*SOLIDAGO* spp.)

Approximately 100 species of this weed can be found in the U.S. and Canada.

Some species grow in damp woodlands, others in dry open areas; related species tend to cross boundaries so more than one species can be found in some areas. Goldenrod, native to North America, is a cultivated horticultural plant as well as a bothersome weed, depending on where and when the plant grows. This plant has a long history as a source for yellow and gold dye; our colonial ancestors used it instead of imported weld and other dyes. The top half of the 5-foot-long stems with leaves and blossoms produced these colors: No mordant — yellow; Alum — bright yellow; Chrome — gold; Copper — bright green-gold; Tin — very bright gold; Iron — dark olive green.

Fastness: no visible fading from light or washing.

Mallow (*MALVA NEGLECTA*)

Mallow is a somewhat deceptive weed introduced from Eurasia. The low growing, limp-stemmed plant has small white flowers followed by little seed wheels that give the plant one of its common names, "fairy cheeses." The inch-wide leaves that stay green all summer and the unripe seeds can be used as pot greens. Gardeners often dislike mallow, however, because even half-grown plants can be quite difficult to pull, and unless the root is cut off well below soil surface, it will send out new stems. Stems with blossoms, leaves and fruits gave these colors in mid-summer: No mordant — light brass; Alum — golden tan; Chrome — gold; Copper — gray-green; Tin — gold; Iron — dark olive.

Fastness: Iron browned and tin dulled; others showed no visible change.

Mullein (*VERBASCUM THAPSUS*)

Here's another naturalized Eurasian plant that has spread across vacant land, especially dry rocky areas. Mullein is bi-

ennial, with a furry rosette of leaves the first year topped by a tall (to 6 feet or more) stalk with an elongated spike of small yellow flowers in the second year. Common names such as "Torchweed," "Hag Taper" and "Parson's Staff" refer to ages past when the dry stalks in winter were dipped in tallow and used as torches to repel witches. You don't have to be either a witch or a parson to get a fine set of colors from leaves and blooming stalks in August.

No mordant — gray-yellow; Alum — gray-yellow; Chrome — brass; Copper — brass; Tin — brass; Iron — dark olive.

Fastness: Iron browned slightly in light; others unchanged from light or washing.

Ragweed (Giant)

(*AMBROSIA TRIFIDA*)

You'll find one or another member of the ragweed clan in every state and across southern Canada, and they all make some people sneeze during pollen season. You can help cure the sneezing by brewing lots of ragweeds in your dyepot. Of the three most common ragweeds (*A. trifida*, *A. artemisiifolia* and *A. psilostachya*), only giant ragweed is a European import. This plant grows tall (10 feet or more in fertile soil) and has tiny spikes of yellow flowers that bleed red if you pinch them. Alas, not red dye, however; but you can get some really fast "composite family" shades at the same time you eliminate some pollen-making weeds.

No mordant — brass; Alum — yellow-gold; Chrome — rust; Copper — green gold; Tin — bright brass; Iron — dark olive.

Fastness: no visible fading.

Redroot Pigweed

(*AMARANTHUS RETROFLEXUS*)

Although a native of tropical America, this tough, adaptable plant has spread

across the U.S. and southern Canada. In some areas redroot pigweed has poisoned cattle with its concentrated nitrates, but humans eat the dark green leaves as a potherb. Redroot pigweed, which you're as likely to find in your garden as in the "wild," has a red taproot, thus its common name. From leaves, flowers and washed stems you should get colors like these:

No mordant — brass; Alum — light gold; Chrome — brass; Copper — brass; Tin — bright brass; Iron — olive.

Fastness: very slight fading in light and from washing.

(Canadian) Thistle

(*CIRSIIUM ARVENSE*)

Finally there's a use for this prickly, noxious weed that blankets the southern part of Canada and the northern half of the U.S. Although it's called Canadian thistle, it comes from Eurasia like its cousin, the bull thistle (*Cirsium vulgare*). Thistles generally are wonderful colonizers; the Canadian thistle, a perennial, has deep, spreading roots and produces too many parachute seeds to count. Its growth habit allows it to rapidly fill waste areas and fallow cropland. Once it's settled, it's nearly impossible to eradicate. You can use all the stems, leaves and flowers you want of this plant and its relatives to produce some interesting colors. Though the colors fade slightly, the longer the fiber spends in the dye (e.g., cool 24 hours after simmering), the faster the dye. Don't let the wool ferment in the thistle bath, however.

No mordant — light gray yellow; Alum — light brass; Chrome — brass; Copper — brass; Tin — brass; Iron — olive.

Fastness: fades slightly in light; no visible fading when washed. ❖



Wild plants collected from hills and fields can yield dyes.

W I L D P L A N T D Y E S

J. DANIEL SAFFER

As a boy I loved searching the fields and hills around my home in Frederick County, Maryland. Weeds and wildflowers fascinated me then, and years later, my interest was rekindled by the wonder-

J. DANIEL SAFFER is a retired typesetter who researches and collects native plants in the Baltimore area.

ful handbooks of the Brooklyn Botanic Garden. I used to work at the Monumental Printing Company in Baltimore, where the handbooks were printed. Indeed, I was one of the proofreaders who read the first dye handbook, *Dye Plants and Dyeing*, when it was prepared in 1964.

Alas, the Monumental Company closed as offset printing replaced letterpress printing, and I faced an unwelcome early retirement. Looking for something to fill my time, I began to collect and study the wild plants of my area. For years I have recorded the first date of bloom for every weed and wildflower I see; in 1988 I had over a thousand different entries. I like to know the uses and lore of each plant.

Wild dye plants, with their history going back thousands of years, are especially interesting, but they can also be challenging and frustrating. Even a rank beginner in the fields and woods can find many dye plants that can be processed very easily. But instant gratification is not for the wild dye maker. Our subjects require time and patience. I soak plants overnight or for several days, sometimes weeks, in water with a pinch of detergent (never soap) to bring out the color. Patience must be exercised not only in the long soaking but more especially in the final dye preparation. Bring it to a slow simmer, avoiding intense heat. I have ruined many batches of dye by cooking them too fast and too hot, instead of simmering, then waiting. For the best, richest and deepest colors, use the lowest possible heat. Even the finest dyes revert to ugly tans and browns if they are overcooked.

Tans and browns constitute about nine-tenths of the wild plant dyes; you don't get many bright colors. I think that the best and brightest dyes come from the autumn berries. Red sumacs give a coral pink which shifts to lavender or dull purple with the addition of a few rusty nails. Privet berries usually give a nice gray or blue-gray. Fruit of the vibur-

nums, especially maple-leaf viburnum, give blue-violets and purples. Wild grapes give deep lavenders and the fruit of greenbrier or smilax usually gives a blue-gray. Fruits of Boston ivy and its close relative Virginia creeper also give fabulous dyes in the blue-gray-purple range, and their bright red autumnal leaves give a nice red-brown, although not the red that we would desire.

Never count on the shades and colors you are told a plant will make. They vary by any number of factors, and each time you may get a different result. From well-known authors I read of a fabulous vivid orange dye from nutgrass (*Cyperus*), but it never gave me anything like orange. Sometimes, though, I stumbled upon greater dyes than I read of in any book. Once I noticed a mass of tree-of-heaven (*Ailanthus*) leaves in a puddle after a long rain. They had a certain glow and made a fabulous bright ocher dye.

A good way to see if the plants in question will produce a dye is to rub it on a sheet of white paper. This color will usually be brighter or darker than the actual dye, but it gives you a good idea. My first rubbings happened by accident when I noticed that the specimens of jewelweed I gathered for my herbarium produced a bright orange color against the pages of my collecting book.

I don't dye yarn or cloth; I dye paper. I make labels for each common wild plant of the Baltimore area, and when I process a natural dye I dip a set of labels in the dye which that plant makes. In the winter of my retirement, I get comfort from this hobby and the course to which I was steered by the handbooks of the Brooklyn Botanic Garden many years ago. ❖

A BLACK DYE FROM PURPLE LOOSESTRIFE

Su Grierson

Purple loosestrife (*Lythrum salicaria*) has a lovely Gaelic name: Lus-an-sith-chainnt, or "peace-making" plant. It grows in ditches and wet areas, and makes quite a show in July and August when the strong upright stems are heavily loaded with spikes of deep purple flowers. Although it is an uncommon plant in Scotland, in some areas it grows abundantly and it is a beautiful plant to add to a dye garden. (Editor's note: Gardeners in the United States are advised not to plant purple loosestrife, which has become an aggressive weed in wetlands along the East Coast and the northern states. Dyers in those areas should take advantage of existing stands.)

For use as a dye, the flowering tops and stems should be gathered, chopped to fit the dyepot, just covered with water and then boiled until the liq-

uid is the color of strong tea. Allow 40 minutes for this, but longer boiling will do no harm. All dye plants are variable in tinctorial power, but purple loosestrife generally has good dye strength. The plant is rich in tannin. Test a 2:1 ratio (by weight) of fresh plant to dry fiber to start with, then alter the ratio as needed to achieve the desired depth of color.

Strain off the dye liquid and add unmordanted wool. Soak the wool in the dyebath overnight and reheat to the simmering point the next day. Remove the wool while adding just enough ferrous sulphate to turn the dyebath a good black color. Then put the wool back in the dyebath and simmer it, always below the boiling point, until a deep black dye is obtained. Depending on the nature of the fiber, it will take at least an hour to achieve this color. It can be left for longer.

W E L D

HETTY M. WICKENS

Weld is one of my favorite dye plants. It grows well in my garden, the nodding spikes of flowers seem cheerful, and above all, the yellow and gold colors obtained from every aboveground part of the plant are most attractive and reliable. Weld has a long history. The Romans used it to dye wedding garments and the robes of the Vestal Virgins — the maidens chosen to tend the sacred fire in the temple of Vesta, Goddess of the Hearth.

Also known as dyer's weed, dyer's rocket and wild mignonette, weld (*Roseda luteola*) grows wild throughout Europe, and has been cultivated in France, Italy, Germany and Belgium. In Britain it grows on waste ground — on the chalk Downs, on roadsides, especially

near new road works, and on some pit heaps in West Yorkshire.

From seed it grows a distinctive rosette of long narrow green leaves, with a long thin taproot. A long smooth stem grows up from the rosette, first as a single spike of tiny yellow and green flowers, later branching to bear side spikes of flowers. Weld flowers are heliotropic; in the morning they face east, gradually following the sun until by evening they have turned to the west. Normally weld grows to about 1 meter (just over three feet) in height, but the plants in my garden often reach two meters. Some dyers prefer to use a shorter weld, but so far, my tall weld has been very satisfactory. One of my plants had 36 spikes branching off the main stalk, and I counted at least 300 flowers on one spike. Each flower bears about 25 tiny seeds, so one spike could contain 7,500 seeds; the whole plant could make 250,000 seeds!

Thinking of seeds leads on to the subject of harvesting. Collect weld in June or

HETTY M. WICKENS lives in Ashington, West Sussex, England. She is the author of *Natural Dyes for Spinners and Weavers* (London: Batsford, 1983), and before retiring, she was senior lecturer in the textile department at Coventry College of Education, now part of Warwick University.

July, just before the seeds are ready to scatter. The lower leaves will have started to turn yellow by this time. The little black seeds are easy to see, packed tightly inside the tiny green and yellow capsules which followed the flowers. Take care not to scatter the seeds while cutting the weld, unless numerous plants are required. If weld has taken a liking to your garden, it could become a nuisance, with little rosettes of bright green appearing in unexpected places — weld plants are thriving now in my strawberry tub. However, I've found that the seeds don't scatter unless I've left the harvesting until too late. At the right time, they seem to be firmly fixed to the stems. And it's easy to pull out or hoe up unwanted seedlings.

Weld can be used fresh or dried, but I get a slightly stronger color from the freshly picked plants. To store it for later use, let the weld dry in the air and then tie it up in bundles. It will look like straw. When I dry weld, I place the cut stems loosely in a paper bag in order to collect the seeds, which are a valuable additional source of color.

Dyeing with Weld

The amount of weld used in the dyebath will vary according to the depth of color required and the quality of the plants being used. An average ratio would be a pound of weld for a pound of wool. Break or cut up the stems, spikes and leaves. (I did a few experiments to test for dye in parts of the plant that haven't traditionally been used; the seeds gave a clear yellow, but the roots produced no color.) Cover the weld with soft water and bring the pot slowly to a boil. Gradually the plant parts will soften and the water will turn yellow. Opinions vary as to whether the dyestuff should be left in with the yarn; if so, the color will be deeper than if the liquid is strained off.

PHOTOGRAPH BY AUTHOR



Weld can be used fresh or dried.

Add premordanted yarn to the dyebath and simmer for about an hour. Remove the yarn, rinse it in soapy and then in clear water, and dry it in the shade.

Weld has given me excellent results on wool, silk and nylon. Colors vary from lemon yellow or bright yellow to gold or olive, depending on the quality of the weld and the season when it was grown, the type of material being dyed and the mordant used. Alum brings out a clear lemon yellow, chrome gives a warmer yellow, tin brightens and iron turns the color to olive. A bit of chalk added to the dyebath makes the color more intense. When experimenting, have plenty of little skeins mordanted and ready to dip into dyebaths, so you can continue until the color is exhausted. Finally, weld is extremely useful in conjunction with indigo for producing a variety of greens. If dyeing with indigo first, try to avoid too dark a blue, as the yellow is less effective on a dark background. ❖

FLOWERS FOR DYEING

RITA BUCHANAN

Many flowers in the composite family can be used as dye sources. Some are wildflowers, and others are popular garden flowers. A delightful way to obtain cheerful, sunny shades of rusty red, orange, gold and yellow is to grow rows and beds of coreopsis, cosmos, rudbeckias, dahlias, zinnias, marigolds and other composites. You can enjoy a beautiful garden, cut plenty of bouquets and still have enough left over for dyeing. All of these can be raised from seed at little expense and will bloom over a long season.

Plants to Grow

There are several kinds of coreopsis or tickseed, both annual and perennial, including one species known as dyer's coreopsis (*Coreopsis tinctoria*). Some are conspicuous wildflowers in parts of North America, and all are desirable garden plants with abundant daisylike flowers in shades of gold, rusty brown and mahogany red. The perennial kinds form clumps about a foot in diameter, and have long-stemmed flowers. The annuals usually form stemmy plants about two feet tall. All kinds of coreopsis bloom over a span of several weeks, and you can harvest flowers repeatedly during that

season. The darker-colored flowers give rusty red and bronze dyes.

Cosmos (*Cosmos sulphureus*) 'Diablo', 'Sunny Red', or 'Bright Lights', are popular garden annuals that bear bright red-orange flowers in abundance over a long season. (The tall, old-fashioned garden cosmos with pink, rose or white flowers is *Cosmos bipinnatus*, and isn't useful for dyeing.) Sow the seeds in late spring, and thin to six inches to 12 inches apart. They will begin to bloom in about eight to ten weeks and continue until hard frost. For dyeing, cut or snap off the flower heads at full bloom or just as the petals begin to wither. The plants will bear more flowers over a longer season if you keep picking them regularly. Even if you pick the plants completely bare, more flowers will open in a day or two.

Black-eyed susans (*Rudbeckia hirta* and other species), dahlias (*Dahlia pinnata*), zinnias (*Zinnia elegans*) and marigolds (*Tagetes erecta* and *T. patula*) are familiar and popular among all gardeners. Flowers of any varieties of these plants can be used for dyeing, so plant whatever kind and color you like.

The pungent ferny foliage and the buttonlike yellow flowers of tansy (*Tanacetum vulgare*) give shades of yellow

and yellow-green. The leaves and flowers of goldenrod (*Solidago* spp.) also give good yellows and greenish yellows. Gather tansy or goldenrod flowers just as they open for the clearest yellow dyes.

Dyer's chamomile, or golden marguerite (*Anthemis tinctoria*), is a bushy herbaceous perennial with ferny dissected foliage and daisylike yellow flowers that give yellow and tan dyes. Other chamomiles can also be used for dyeing, including the herb chamomile (*A. nobilis*) which make a soothing hot tea, and the weedy fetid chamomile, stinkweed or dog fennel (*A. cotula*).

Safflower (*Carthamus tinctorius*) has long been cultivated as a dye plant in China, Japan and India. An annual that grows quickly from seed, safflower looks like a thistle, with spiny leaves and stems and spiny-rimmed flower heads. The reddish-gold florets which form a tuft in the center of the flower head contain two distinct pigments, a yellow and a red. Both can be used for dyeing, but the red has always been more highly valued. Long ago, safflower red was used to dye cotton tapes for tying legal documents together — the original "red tape." Safflower is easy to grow, but each plant yields only a handful of florets, and it's hard to pluck them without running into the spines.

Dyeing with Flowers

Start with about two pounds of flowers in three gallons of water and simmer for a half hour or until the flowers are bleached, then strain off the liquid for a dyebath. This is enough to dye four ounces of pre-mordanted wool if you want dark, rich colors, or more wool if you want pastel colors. Put the wool in the dyebath and simmer for an hour, then either cool and rinse promptly for light colors or leave to sit overnight for deeper colors. If the first batch of yarn comes out dark-colored, try dyeing successive skeins for progressively lighter shades of the same hue. In my experience, dyes from flowers are moderately fast to light and washing on wool, but ineffective for cotton or other plant fibers. Quite a range of colors can be produced from these flowers, depending on how concentrated the dyebath is, what mordants and additives are used and how long the fibers are left to simmer or soak. You'll want to experiment with all these variables. In particular, these are good dyes for comparing the effects of different mordants. Also, check the effects of raising or lowering the dyebath pH by adding a few spoonfuls of baking soda or vinegar. ❖

LADY'S BEDSTRAW

A SCOTTISH DYEPLANT FOR WOOL

SU GRIERSON

PHOTOGRAPH BY AUTHOR



An array of yarns dyed with natural materials.

Dyers in every country and during every age have sought red dyes of lasting value, and in every land at least one native red dye has usually been found. In Scotland, the major red dye was extracted from the roots of lady's bedstraw (*Galium verum*), a member of the madder family (Rubiaceae).

This perennial plant grows throughout Scotland in roadside verges and

hedgebanks, and in dry sandy places, particularly coastal regions, where large colonies can form. It is easily cultivated and will produce a large root system in light soil. In the 19th century some attempts were made at growing lady's bedstraw commercially, as madder was grown, but it seems that none of these experiments were economically successful.

Lady's bedstraw has creeping, hairless, four-angled stems with many whorls of tiny single-veined leaves that are smooth

SU GRIERSON is a dyer from Scotland.

and dark green on top and downy below. Terminal panicles of small bright yellow flowers are usually borne on erect stems between June and September. The flowering tops of the plant can be used with an alum mordant to produce a yellow dye, but among Scottish plants, ling heather tops and bog myrtle leaves offer stronger, more permanent yellow dyes. Traditionally, using lady's bedstraw tops to coagulate milk for cheesemaking was more beneficial than using them for a dyestuff. Below ground, there are shallow rhizomes up to 1-1/2 inches thick and much finer roots which may extend six feet in dry soil. The red dye is present in all sizes of roots, but the color from the rhizomes is darker (less yellow) and more concentrated.

Although lady's bedstraw is a widespread plant in Scotland, it's difficult if not impossible to collect the roots in areas where a variety of vegetation has produced complex intertwined root systems. However, it is easy to extract long bedstraw roots from the grasses and flowers growing on the Machair — the sandy coastal areas that run along the western sea front of the Outer Hebridean Islands. Not surprisingly, the tradition of making red bedstraw dye was concentrated in these areas.

In the 18th and 19th centuries, visitors to the Outer Islands reported on the use of the red dye, but clearly it was a tradition with much earlier beginnings. Indeed, digging these roots, together with roots of tormentilla (*Potentilla erecta*) for tanning purposes, caused such unsightly scars and erosion that a Soils Preservation Act was passed in 1695 to prohibit the pulling of plants along the sea coast. But the desire for this beautiful red dye ran deep, and the local people continued to dig the roots on illegal expeditions in the dark of night. The islanders invested their clandestine escapades with

their Celtic love of story telling and many a tale was told of uncanny nighttime happenings while digging the precious roots.

As with all dye plants, the tinctorial properties of the roots vary. Traditional gatherers — people from small communities who collected dye plants from the same limited geographical area for generations — learned that plants from specific sites or in particular growing conditions offered better or worse dyes, and they gathered them accordingly. This was clearly expressed by Winifred Shand (*Plants and Gardens* Vol. 20, No. 3). She reported that dyers on the Hebridean island of South Uist found one sack of local bedstraw roots was sufficient for a dye-bath, but if they went to the island of Barra, less than 25 miles away, they needed to gather two sacks for the same results.

Other members of the genus *Galium* have historically been used for dyeing, but less so than lady's bedstraw. They possess a similar coloring matter, but their root systems tend to be smaller, and they often grow in situations where digging would be a difficult and unrewarding task.

Both northern bedstraw (*G. boreale*) and hedge bedstraw (*G. mollugo*) roots have been recorded as red dyestuffs in various parts of Europe, but they were not sufficiently plentiful to use in Scotland. Sweet woodruff (*G. odoratum*, formerly *Asperula odorata*), which grows wild in a few areas of Scotland and can easily be grown in gardens, produces a good red dye from its roots. Sweet woodruff is sometimes confused with dyer's woodruff (*A. tinctoria*), which grows wild in France and Denmark and was at one time used as substitute for wild madder. Wild madder itself (*Rubia peregrina*) does not grow in Scotland, but its use has been recorded in Ireland, where it grows on the Burren and Aran Islands.

For the modern craft dyer the most useful species, second to lady's bedstraw, is likely to be *G. aparine*, known by many local names but most frequently called goosegrass or cleavers. This plant with its creeping habits and millions of tiny clinging burs is a scourge of gardens and hedgerows. However, if dug out with much patience — essential anyway if it is ever to be eliminated from the garden — then a good supply of the very small roots can be obtained. Gathered in August and dried in the sun, these roots can produce red and rose colors on alum-mordanted wool.

How to Use Lady's Bedstraw for Dyeing Wool

I can't state the best age at which plants should be dug for dye purposes, but it appears that older plants yield more dye, and of a darker color, than young plants do. Also, the dye made from fresh roots is generally more orange in color than that from dried roots. Roots for dyeing can be dug at any time, cleaned and air dried, and chopped into lengths suitable for storage or use. The dye is thought to reside in the outer bark of the root and some traditional recipes suggest that it should be separated from the roots for dyeing, but good colors can be achieved without embarking on this laborious task.

Try starting with a 3:1 ratio of roots to wool (measuring dry weight). Depending on the quality of the roots and the depth of color required, you can amend this ratio for subsequent dyeings. A successful dyer doesn't rely on fixed recipes, but learns to make judgments and adjustments as needed.

Traditionally, roots were boiled for many hours before being strained, then mordanted wool was added to the liquid and boiled again during the dyeing. This

traditional method is simple, but it often gives the wool a brick-red or brown-red color, due to the influence of yellow and brown pigments that accompany the red dye in the roots. During the 20th century in the Outer Isles, tin was sometimes used as a mordant for this dye, because it produces a more vivid red color on the yarn, even from a brownish dyebath. However, the tin-mordanted color is not lightfast, and becomes more yellow as it fades. Alum-mordanted wool fades less than that treated with tin, and turns pinkish instead of yellowish. Iron or chrome mordants give darker brown or purple shades.

Following a more complicated procedure gives clear red colors by reducing the uptake of the yellow or brown pigments: First chop the dried roots into small pieces, then soak them in cold water for 24 hours. Slowly heat the roots and soaking liquid and simmer at just below the boiling point until the dye liquid shows a good red color. Strain off this liquid into a second dye vessel and allow it to cool slightly. Add wet, alum-mordanted yarn and keep the second pot hot, but always below the boiling point. (This is important because apart from the possibility of damaging or felting the wool, higher temperatures bring out more of the yellow and brown dye components.)

Meanwhile, cover the roots with fresh water and slowly heat them again until the liquid is a good red color, a process that takes about an hour. By this time, the yarn will have absorbed most of the red dye from the first batch of liquid, which can be discarded. Strain the second batch of liquid off the roots and put the yarn into it for a second dyeing. This process can be repeated several times, stopping when the roots give only a brown color to the water. This method produces a rich red color on wool. ❖

NEW WAYS TO USE EUCALYPT DYES

JEAN CARMAN

Since 1968 I have investigated the dyes from over 200 species of *Eucalyptus* from all parts of Australia. At first I primarily dyed wool, but in recent years I have used the eucalypt dyes to paint and dye silk and cotton fabrics and embroidery threads, and as a paste for screen and block printing. Here are three new methods for using eucalypt dyes. (Editor's note: These techniques may be adapted for using dyes from other plants.)

1. PRINTING PASTES FOR SCREEN PRINTING AND BLOCK PRINTING. Prepare a very strong eucalypt dyebath and reduce it to a thick paste by boiling or standing it in the hot sun. Add the paste to a printing base (available from textile crafts suppliers). The paste can be used with standard printing techniques on fabric or paper.

JEAN CARMAN is the author of *Dyemaking with Eucalypts*, published in 1985 by Kangaroo Press. She lives in Queensland, Australia.

For special effects, place pressed leaves or small flowers between the screen and the fabric or paper before printing. Fix the dye color by ironing the fabric 24 hours after printing.

2. THICKENED DYE SOLUTIONS FOR PAINTING. Use dye thickener (from crafts suppliers) to thicken a solution of eucalypt dye. The thickened dye can be used for painting on paper or clothing. Again fix the dye by ironing after 24 hours. The eucalypt dyes have proven color fastness and can be washed.

3. EUCALYPT SAWDUST PASTE FOR BLOCK PRINTING. Mix sawdust with printing base and apply to a wooden printing block with a paint brush. Press paper firmly against the block, and gently lift it off. Sawdusts from different species will give varied hues. Adding a bit of ferrous sulphate (iron mordant) to the printing base will give a gray-black color, and copper sulphate will give a greenish tone. ❖

EUCALYPT DYES ABROAD

During 1977 I visited China with a delegation of the Australia/China Friendship Society. We travelled to Guangxi Province in southeastern China. Eucalypts have been planted extensively throughout China and my task was to introduce the eucalypt dyes to the textile people in Guangxi. They were using the eucalypt leaves as insect repellents and for medicinal purposes, and were interested to learn about their dye potential.

In 1988 I visited the Japanese Pavilion at Expo '88 (the celebration of the Australian Bicentennial), to meet with people from Saitama Prefecture in Japan, the sister-state of Queensland, Australia. It was to a zoo in Saitama that koalas were first sent in 1984; now koalas are kept in six zoos in Japan, and 33 different species of eucalypts have been planted throughout Japan to provide food for the koalas.

I learned that scraps of eucalyptus leaves which the koalas had not eaten were sent to the Textile Testing Station in Saitama, and dyes were extracted from them. The Japanese thought that this was the first time eucalypt leaves had been used for dyeing. They presented me with a silk tie which was

finely woven with irregular stripes in muted shades of yellow, gray and gray-green.

We compared techniques of dyeing. The Japanese method for extracting dyes from plants, which has developed over thousands of years, is more complicated than mine. My method is simple and the colors depend very much on the species of eucalypt being used. One of the Japanese expressed his regret that the colors they had obtained were so muted. I told him that bright colors can be obtained, and gave the Japanese leaves from *E. cinerea* and *E. microcarpa*, which give bright red dyes. I also gave them samples of dyed wool and silk, and showed them beautiful examples of eucalypt dyeing done by other Australian craft workers.

A friend who recently returned from a trip to Japan told me that she visited the zoo in Saitama. In the gift shop there she saw a number of articles woven from silk dyed with eucalypt leaves, such as mats, handkerchiefs, scarves, ties and tablecloths with a motif of a koala in each corner. She told me these items were beautifully packaged — in some, a eucalypt leaf was included, and they were quite expensive.

— Jean Carman

DYEMAKING WITH EUCALYPTS IN AUSTRALIA

DIANA COCKBURN & MARY JOST
FOR THE PLANT CRAFT COTTAGE DYE GROUP

The genus *Eucalyptus* consists of over 600 species. They are all native to Australia and Papua, New Guinea, but because they tolerate different growing conditions, eucalypts now are planted throughout the world. All eucalypt leaves give color, but the excitement is in the range from pale yellow to deep dark red — mellow shades that reflect the unique colors of the Australian bush. The bark and fruit usually give more muted reds, grays and browns.

Many Australian craft workers use the eucalypt dyes. Our dye group has investigated them in a methodical way, and prepared a collection of dye samples for the Royal Botanic Gardens in Melbourne. Each sample is labelled with relevant details of the source, collection date and dyeing methods used. One series of dye samples is accompanied by herbarium specimens from the actual trees used.

There has always been discussion on whether fresh or dried leaves make the better dyestuff. The group experimented by stripping fresh leaves from a branch,

mixing them well and weighing out many portions of equal weight. One portion was used as dyestuff while fresh; the others were allowed to dry and used after one week, then monthly for one year. Only slight color change resulted.

The intensity of color and the shade are affected by growing conditions and weather. Colors in years of flood or drought can vary dramatically from normal. To investigate the effects of season, we used leaves from two trees as dyestuff, picked at quarterly intervals for one year and then approximately monthly for two years. Color variations were evident, but no conclusions could be drawn because there were too many variables.

Dyeing Procedures

For each sample, we record the botanical and common name of the plant, the dates of collection and of dyeing, the part of the plant used, the weight of dyestuff, the type and weight of fiber and the recipe, including details of mordanting.

We normally use a 4:1 ratio of dyestuff to wool, although good colors can be achieved with less dyestuff. We cover the dried, crushed dyestuff with boiling water and let it stand overnight. Then we slowly heat the dyebath to 90 degrees C

DIANA COCKBURN AND MARY JOST are active in the world of textile crafts in Australia. Members of Plant Craft Cottage Dye Group have been studying eucalypt dyes since 1981 at the Royal Botanic Gardens, Melbourne, Australia.

(195 degrees F), simmer at that temperature for one hour, and let it cool overnight. We use the following two methods of testing the color range obtainable.

SUBSTANTIVE TIME SERIES: One of the most interesting areas of experimentation is a substantive time series. No mordants are used. Four skeins of scoured wool yarn are entered into the prepared dyebath and simmered along with the eucalypt leaves, bark or fruit. The skeins are removed one at a time after one, two, three and four hours of simmering. Colors obtained vary among species. Some give fawn shades only, others give oranges, tans, browns, reds, and dark claret after four hours' simmering. The dyeing may be streaky at first, but longer-cooked samples develop more even color. Boiling the dyebath with wool and dyestuff in it can produce ever darker colors, but the wool quality will suffer. The lightfastness of the substantive dyes is fair to good. Species from which dark reds have been obtained by this method include *E. cinerea*, *E. crenulata*, *E. melliodora*, *E. nicholii*, *E. polyanthemus*, and *E. sideroxylon*.

GERBER INVESTIGATIVE METHOD: This method, developed by American dyer Fred Gerber, produces 16 colors from one dyestuff. To start, eight skeins of wool are premordanted with alum and eight with chrome. Then portions of the prepared, strained, dyebath are modified with tin, copper, iron and ammonia. Mordant quantities per 500 gr. (slightly over a pound) of clean dry wool are 85 gr. of alum and 14 gr. each of chrome, tin, copper or iron. Weigh your wool first and measure the appropriate amount of mordant.

Here is the step-by-step procedure for dyeing alum-mordanted skeins. Follow the same sequence for the chrome series.

1. Put the eight alum-mordanted skeins into the dyepot. Heat slowly and

simmer at 90 degrees C (195 degrees F) for one hour. Remove all skeins. Wash and rinse one skein, and label it "Alum a." Put a small amount of dyebath in a separate pot, add a teaspoon of household ammonia and stir well. Re-enter one skein, simmer 5 minutes, then wash and rinse it well. Label it "Alum b." Divide the remaining dyebath into three parts.

2. To one part, add tin mordant and stir well. Re-enter two dyed skeins and simmer for 15 minutes. Wash and rinse one skein and label it "Alum c." Add a teaspoon of ammonia to dyebath, re-enter the other skein and simmer for 5 minutes, then wash and rinse it well. Label it "Alum d."

3. To another part, add copper mordant and repeat the steps. Label "Alum e" and "Alum f."

4. To the last part, add iron mordant and repeat the steps. Label "Alum g" and "Alum h."

The lightfastness of the alum series is good, and that of the chrome series is very good. Different species give this range of colors: Green: *E. bicostata*, *E. callophylla*, *E. globulus*, *E. microcarpa*; Yellow: *E. cladocalyx*, *E. radiata*, *E. scoparia*; Yellow-Gold: *E. moluccana*, *E. sideroxylon*; Orange: *E. cinerea*, *E. crenulata*; Brown: *E. bancroftii*, *E. lehmannii*. These related colors in shades of yellows, greens, oranges and golds make an interesting resource for tapestry, needlepoint and other crafts. ♦

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TRADITIONAL PLANT DYES IN JAPAN

SEIKO HIROTA

The Japanese people have enjoyed dyeing since ancient times. The original techniques were introduced from China or Korea, but by the 8th century characteristic Japanese techniques had started to develop. Dyeing skills improved over time and flourished from the 17th to 19th century; in that era, professional dyers called *chonin* achieved marvelous results. In Japan, two colors in particular — the blue from indigo and the red from safflower, are most important, and have been used since ancient times.

During the 20th century the old dyeing skills using natural resources have been discarded little by little, but we still have natural plant dyes in Japan. For example, Mr. Akira Yamazaki researched and published a book about the *kusaki-zome* or traditional Japanese plant dyes in 1961. Now his son Seiju Yamazaki is following his father's footsteps. In villages and towns you sometimes come upon exhibitions showing the work of amateur dyers who learned the craft at adult-education classes or at art colleges.

SEIKO HIROTA is the author of two books on growing and using herbs. She lives in Kanagawa, Japan.

Also we have an extremely special elementary school. It is located on Awaji Island between Honshu and Shikoku. The school's name is *shitoori*, which means "closely connected with cloth" in Japanese. All the pupils cultivate dye plants such as Japanese indigo (*Polygonum tinctorium*), safflower (*Carthamus tinctorius*), French marigold (*Tagetes patula*) and kusagi (*Clerodendron trichotomum*). Using their own plants, they learn dyeing techniques such as batik, *itajime* — a sort of variegated effect made with wood chips, and *tataki-zome* — a way of mashing the plants on the cloth. According to the pupils' age they learn to spin yarn and weave cloth. I think such artistic and historical lessons help us appreciate nature's blessings in our daily life, and it is likely that many schools will introduce this kind of curriculum in the future.

A Japanese Procedure for Dyeing Wool or Silk

1. Weigh the yarn or cloth, and weigh out the same amount of dye plants.
2. Put the dye plants into a stainless steel or enamel pan and cover with water. Bring to a boil and simmer for 30 minutes, then strain off the liquid. This is the

dyebath. Let it cool down.

3. Gently wash the yarn in tepid water with a small amount of detergent. Rinse it well.

4. Put the wet yarn into the dyebath. Over a period of about 30 minutes, raise the temperature to 80 degrees C (180 degrees F). Don't let it boil. Simmer for 30 minutes, stirring with chopsticks from time to time to prevent uneven dyeing.

5. Meanwhile prepare a mordant solution. Dissolve an amount of alum equal to 10% of the weight of the yarn in enough water to thoroughly cover the yarn. Add the dyed yarn to the mordant solution, and slowly heat it to 80 degrees C for 30 minutes.

6. After mordanting, rinse the yarn, then return it to the dye solution and re-heat it to 80 degrees C for a second dyeing. This fixes the color.

7. Wash the yarn thoroughly, squeeze out extra moisture, and let it dry in the shade.

A Sampler of Dye Plants

I find great pleasure in dyeing fabrics and yarns with wild plants and plants I have grown. How wonderful natural colors are! I will describe some dye plants which are familiar in Japanese everyday life.

HAMANASU or rugosa rose (*Rosa rugosa*) grows wild in the northeast Japan. This rose is a very hardy deciduous shrub with fragrant flowers and large rose hips which are used in preserves and medicines. The leaves, stems and rhizomes are used for dyeing, giving brown with chrome and reddish gray with iron.

KANAMUGURA or hops (*Humulus japonicus*) is a vigorous vine whose palmate leaves and stems are covered with irritating hairs, but the colors of hop dyes are very mild and subtle. Gather fresh leaves and stems in October. Hops gives pink with no mordant, beautiful yellow with

alum, greenish-gray with iron and yellow-brown with copper.

UKON or turmeric (*Curcuma longa*) is a tropical plant from India and Indonesia that is cultivated in parts of Japan where the climate is mild. It has large leaves, beautiful white flowers and a yellow rhizome which is useful as a medicine and in oriental cooking as well as for dyeing. You can use the rhizome either fresh or dried. It gives a beautiful golden color with alum, golden-brown with iron and orange with tin.

CHA or tea (*Thea sinensis*) is an evergreen tree from China which can be grown in mild regions of Japan. It bears white flowers from October to December. For dyeing you can use green tea, black tea or Chinese tea. If you use the fresh green leaves, add a little wood-ash solution to make the dyebath alkaline. Tea leaves dye light brown with no mordant, light pinkish-brown with tin and gray with iron.

YOMOGI or artemisia (*Artemisia princeps*) grows everywhere along the banks of rivers. We eat the young leaves and chop the stems for a bath herb and a medicinal herb that aids digestion. This plant gives brown with alum, olive green with copper and dark greenish-gray with iron. The colors are stronger in autumn than in spring.

SHUNGIKU or edible chrysanthemum (*Chrysanthemum coronarium*) is an annual herb cultivated as a vegetable in Japan. All parts are scented. If you use boiled leaves, it dyes a beautiful green color with copper, dark brown with iron and brown with aluminum.

GENNOSHOKO or geranium (*Geranium thunbergii*) is a popular perennial wildflower. It is used as a traditional medicine for stomachache and diarrhea. Gather the leaves from summer to fall for dyeing. It gives yellow-brown with wood-ash juice and alum, liver color with copper and brownish-gray with iron.



Delicate gradations of color can be produced in silk dyed with hops by changing mordants.

Kusagi-zome or Kusagi Dyeing

This is a special technique for obtaining beautiful blue dyes from the berries of *kusagi* or glorybower (*Clerodendron trichotomum*). *Kusagi* is a deciduous shrub growing 6 feet to 15 feet tall. Its opposite leaves have a bad smell, but the white flowers, borne from August through September, have a lovely fragrance. In the fall it bears blue berries with reddish violet calyxes. You can get a beautiful light blue color from the dyes without using a mordant, and a sober gray color from the calyxes. The blue dye works better on silk than on wool.

For dyeing, gather the jewel-like berries in October and separate them from the star-shaped calyxes. Use enough berries to equal two to three times the weight of the silk you want to dye. Put the berries in a nylon stocking and crush them thoroughly to extract the juice. Add the berry juice and the silk to a pan of water, heat gently to 85 degrees C (185 degrees F) and simmer for 45 minutes. To promote oxidation of the dye solution, add 0.5% by weight of hydrogen peroxide. Let the silk cool and rinse it thoroughly, then dry it in the shade. Re-dyeing the same silk with additional dye-baths gives a darker blue color. ❖

G R O W Y O U R O W N I N D I G O

RITA BUCHANAN

Indigo is produced in the leaves of several plants, but most are tender tropics. The three indigo sources that I've grown and used are woad (*Isatis tinctoria*), indigo (*Indigofera suffruticosa*) and dyer's knotweed or Japanese indigo (*Polygonum tinctorium*).

Woad

Woad is commonly planted in herb gardens, and has spread as a weed along roadsides and in agricultural fields in the United States. Some states list it as a "noxious weed", although it's much less invasive than bindweed, Russian thistle, or many other weeds. The responsible way to grow woad is to cut down the flower stems before the seeds mature; that done, it won't spread in your own or your neighbors' gardens.

To raise a supply of woad for dyeing, sow seeds directly in the garden at the time when daffodils are blooming. Space seeds a few inches apart and cover them one-half inch deep, and as the seedlings begin to grow, thin to one plant per square foot. Woad is a biennial, and grows a rosette of slightly hairy leaves the first season. Single plants can reach the size of a dinnerplate by midsummer. Harvest leaves for dyeing by plucking handfuls from around the bottom of each plant. More leaves will grow up in the center, and you can harvest from the

same plants several times between July and October. Under good conditions, each woad plant may produce eight ounces of leaves over the season.

Usually I dig up all my woad plants before winter and toss them on the compost pile. Every few years, I leave two or three plants to winter over. Woad's no good for dyeing in the second year; all the potential indigo is converted into another compound that triggers blooming. In early spring, each plant sends up one or more three-foot-tall stems of bright yellow flowers. After flowering, the rosette of leaves withers and dies, and hundreds of flat, papery, purple-brown fruits about one-half inch long dangle like earrings from the branched stems. I gather these before they start to blow away, to renew my seed supply.

Indigo

A shrubby perennial native to the New World tropics, indigo (*Indigofera suffruticosa*) can be grown as an annual crop where the growing season includes at least four months of daytime temperatures in the 80s or 90s, or you can grow a single plant in a six-inch flowerpot on a sunny windowsill just for fun. When the ground is comfortably warm in the spring, soak the hard little seeds in water overnight, then sow them one-half inch deep and three inches apart. Or start them indoors

six to eight weeks earlier, and transplant them to the garden after all danger of cold weather is past. Indigo seedlings tolerate transplanting, but they sulk and stop growing if exposed to temperatures below about 45 degrees F. Thin or transplant seedlings to a spacing of eight inches apart. Indigo has erect stems three feet to four feet tall with short branches, and compound leaves two inches to three inches long with nine to 17 paired leaflets. You'll have to look closely to notice the delicate sprays of tiny pinkish-bronze pealike flowers. For dyeing, pick just the leaves, preferably during hot, dry weather and as the plant is beginning to bloom. Omit the stems; they are bulky and don't contribute any pigment to the dyepot. Harvested a few times at two-week intervals, a half-dozen indigo plants can provide one to two pounds of fresh leaves in a season.

Japanese Indigo

Dyer's knotweed or Japanese indigo (*Polygonum tinctorium*) is a tender annual native to eastern Asia and Japan and used there for centuries as an indigo source. You may be familiar with other species of knotweeds; many are common as garden flowers or weeds. Only dyer's knotweed is useful as an indigo source. It's *never* found wild in this country — you have to raise your own from seed. I

sow seeds indoors six weeks before the last frost, and transplant the seedlings into the garden when the soil and weather are warm. I set them about 12 inches apart. Dyer's knotweed has smooth stems with swollen joints and simple alternate leaves about four inches long, and grows two feet to three feet tall. For dyeing, pick or strip the green leaves off the stems, starting from the base of the plant. You can pick half the leaves off a plant at one time without hindering its growth; in fact, the more leaves you pick, the more that grow. A half-dozen plants can yield more than two pounds of leaves between mid-summer and killing frost. Dyer's knotweed is quite showy in the fall, when it bears slender clusters of tiny pink flowers. Protect the plants with a blanket or sheet when the first light frosts come in fall, to keep them alive and give the seeds a chance to ripen. When the chaffy floral bracts have turned from pink to tan, gather the seed clusters and thresh out the small black seeds to save.

Dyeing with Fresh Indigo

Using indigo is different from dyeing with other plants, but it isn't any more difficult. I use the following method to dye with woad, *Indigofera suffruticosa*, or dyer's knotweed. From start to finish, the process takes less than eight hours. Like



Woad, *Isatis tinctoria*, growing in a row in a dyer's garden.



Here a dyer is shown pouring off an indigo solution.

baking bread, you can do other things in between the key steps.

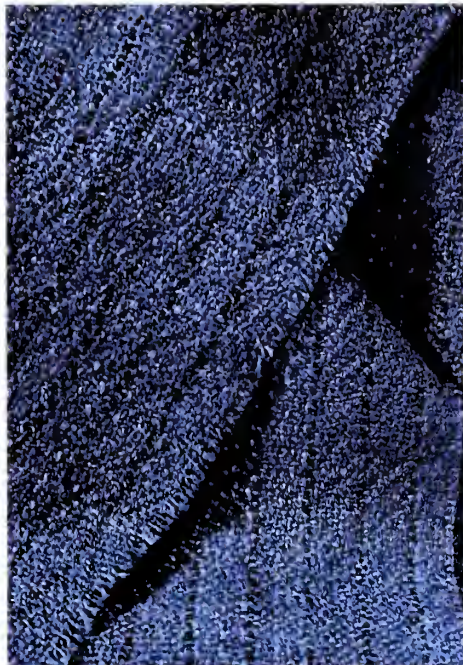
Start by gathering fresh leaves. Pigment yield varies among these plants. I've gotten good color at plant:fiber ratios of 3:1 for *I. suffruticosa*, 4:1 for dyer's knotweed and 8:1 for woad. Weigh the leaves when you pick them, and weigh out an appropriate amount of dry yarn to dye at the same time. Stuff the leaves into a heat-resistant container, leaving little airspace. I put about a pound of leaves in a one-gallon container. There are two ways to take the next step, extracting the pigment. In the case of woad, pour almost-boiling water over the leaves to scald them. Use the minimum amount of water needed to cover the leaves. Cover the container and let it sit about an hour, then squeeze all the fluid out of the leaves and throw them away. Strain and save the warm,

reddish brown liquid. With *I. suffruticosa* or dyer's knotweed leaves, add just enough hot tap water to cover the leaves, cover the container, set it down into a larger kettle of water (like using a double boiler) and heat it to 160 degrees F. over a period of two hours. You can heat it more slowly than that, but don't do it more quickly. Squeeze out the leaves and throw them away. Strain and save the warm, dark fluid. The colored fluids contain a precursor of indigo called indoxyl.

Regardless of which plant you started with, from here on the process is the same. *Don't* dilute the dyebath with any more water — you want it to be as concentrated as possible. Add a tablespoon of baking soda (sodium bicarbonate) per gallon of fluid, to make the solution alkaline. Then, pour the fluid back and forth from one container to another. As the indoxyl reacts with oxygen in the air, it



Wool yarn dyed with *Polygonum tinctorium* is shown next to the plant itself.



Indigo-dyed cloth made of wool dyed, spun and woven by the author.

will change to a dark blue-green or blue-brown color. Keep pouring it back and forth for about several minutes.

To use the indigo for dyeing, it must first be converted from the blue form into a yellowish form called indigo white. Traditional methods of achieving this transformation involved adding stale urine and keeping the mixture warm for several days or weeks of smelly fermentation. Modern methods substitute chemical powders for the urine, and require only a few hours. I add either one tablespoon of Spectralite™ (available from dye suppliers) or two tablespoons of RIT Color Remover™ (available at grocery stores) per gallon of fluid. Sprinkle the powder on the surface of the dye bath and let it sink down by itself. For best results, keep the dye bath at about 100 degrees to 120 degrees F. at this time; I like to set the dye pot in a vessel filled with

very hot water. Meanwhile, put your yarn to soak in warm water. (No mordant is required with indigo.) After an hour or more, when the dye bath has changed to a yellow-tan color, you can add the wet yarn, carefully lowering it down below the surface. Leave it to soak for 20 min. to an hour, then gently draw it out of the dye bath. The yellow color turns to blue as the indigo reacts with oxygen in the air. Let the yarn dry in the air for as long as it soaked in the bath. If you want to intensify the color, repeat the soaking and airing two or more times. After the final airing, wash and rinse the yarn.

Our ancestors knew plants well, as shown by the detail from the "Unicorn" tapestries (shown on page four), woven about 1500. All the colors in the tapestry were made with dyes from plants. Five hundred years later, they are still subtle and lovely. ❖

K U S A K I - Z O M E

J A P A N E S E G R A S S A N D

T R E E D Y E S

M. JOAN LINTAULT

Traditional Japanese resist-dyeing techniques were developed over a period of centuries. They produce beautiful colors and patterns, but the processes are time consuming, precise and labor intensive. Although threatened with replacement by modern techniques and synthetic dyes, the old dyes, called kusaki-zome, are still used today because of the Japanese appreciation for hand-crafted items. This technique was named, researched and developed by Akira Yamazaki in 1958.

The dyestuffs can be purchased from dye or herb suppliers, grown in the garden or foraged in the fields. Dye can be obtained from plant leaves, roots, bark, flowers, insects, fruits and berries or nut hulls. Most plants will yield some color when boiled and processed for dye, but only a few give deep, bright and long-lasting colors. For best results, leaves should be gathered in early summer, flowers just after blooming, whole plants when in bloom, fruit when well ripened, roots

when the plant has died down in the fall, and bark in the spring. Plant parts can be dried out of direct sunlight and stored in a dark place for future use.

The Kusaki-zome method of dyeing involves making highly concentrated dye solutions from the plant materials. These solutions can be stored in the refrigerator until needed.

The dyes are extracted by a series of boilings. A general formula is to start with about four ounces of fresh or dried dyestuff in about three cups of hot water. Use an enamel, stainless steel or glass pot. Boil uncovered until less than half the liquid remains. Strain the liquid through a fine-mesh nylon fabric or stainless steel sieve. Return the same dyestuff to the pot, add more hot water and repeat. Save the results of each extraction separately. Continue the series of boilings until all the color is removed from the material. This may require as few as one extraction for petals and grasses or as many as 10 extractions for

wood and bark. Combine the liquid from the first half of the extractions. These combined will give the darkest color. The liquid combined from the second half will give lighter colors. If desired, further boiling will reduce the combined liquid to make a very concentrated dye.

Extract and store all the dye that you will be using for one project at the same time. Each batch of natural dye is different, even if you use the same kind of plant, often because of variations in the growing conditions.

After boiling, let the dye stand overnight to settle any fine particles. Pour off and save the upper liquid and throw away the sediment. The dye can be stored in the refrigerator. Press a sheet of plastic against the surface of the liquid to seal it from air, and put a tight lid on the container. Since the dye is a natural substance, it is liable to mold if not used promptly. If mold forms on the surface, remove it carefully and test to see if the color remains satisfactory.

Using the Dyes

Kusaki-zome dyes can be applied by immersing the yarn or fabric in the dye liquid; or by painting, printing or stenciling the dye color directly onto a piece of fabric. Immersion dyeing is the process more familiar to many dyers, so I'll describe the general procedure for direct dyeing instead. These dyes can be used on any natural fiber: silk, wool, cotton, linen, ramie or viscose rayon.

First wash the fabric to remove all commercial sizing, then stretch it tightly on a frame or use tenter hooks (*shinshi*). Before dyeing, it is necessary to prepare the surface of the fabric by applying a sizing of soybean milk, which increases dye absorption, prevents wicking and streaking. You can use powdered soy milk from the health food store, mixed according to the directions on the label. Paint it

sparingly on both sides of the fabric with a brush. Dry the soy milk-treated fabric promptly in the sun or in a warm room, so that it doesn't sour.

Adding thickener to the dyes helps keep them from wicking when applied to the fabric. A high viscosity low solids sodium alginate, a gum derived from seaweed, is the best thickener to use. It is available as a powder sold by dye suppliers. Mix a teaspoonful of sodium alginate with one-half cup water in a blender and let stand for at least an hour to thicken. The thickened alginate can be stored in the refrigerator and added to the dyes when necessary. Deciding how much thickener to add to the dye depends on the type of fabric, the dyestuff, and how many applications of dye will be used. From 10% to 50% are the usual amounts. Experiment on a scrap to see what works best for your purposes.

Most dyes require the presence of metallic salts, called mordants, to form a complete bond with the fibers. The Japanese use mordants of an acetic nature rather than a sulfuric acid nature because they believe that sulphate chemicals tend to remain on the fibers even after washing, causing color change or damage to the fibers. The mordants used are aluminum acetate, chromium acetate, cupric acetate, ferrous acetate, potassium dichromate and sodium stannate. There are other chemicals used as dye assistants such as tannic acid.

The formula for each mordant is different. Aluminum acetate is a good all-purpose mordant to begin experimenting with. It gives clear, delicate colors. Mix eleven level teaspoonfuls of powdered aluminum acetate in one quart of warm water.

Paint the thickened dye on the fabric freehand or use a stencil. Let it dry. Then apply the mordant by brushing it carefully onto the dry fabric over all the

dyed areas. Making alternate applications of dye and mordant will deepen and strengthen the colors. Be sure that the fabric dries completely after each application. Repeat as many times as needed until the desired shade of color is obtained. To change colors, different dyes may be applied one over the other, or mixed together before using.

Sappan wood and madder require slightly different formulas. After treating the fabric with mordant, these dyes on cotton require the application of tannin to the fabric in layers alternating with dyestuff and mordant.

After you have finished painting, the

fabric must be steamed to complete the bond between dye, mordant and fiber. Steam pieces of fabric by layering them between sheets of newspaper and placing the stacked bundle on a rack in a large canning pot or steamer. Make sure no two pieces of fabric touch each other or the sides of the pot, or staining will occur. Steam the fabric for about 45 minutes.

Wash the fabric in a mild soap such as Woolite, handling it gently at all times. Rinse several times in tepid water. Do not rub or wring the fabric. Roll it in a towel to remove the excess water or spin out the water in the washing machine. Dry in the open air, protected from direct sun. ❖



These bolts of kimono fabric were dyed naturally.

PHOTO BY M. JOAN LINTAULT

MORDANT SAFETY

rita buchanan

Traditionally, dyers took mordant compounds for granted, but contemporary dyers often express concern about safe handling and disposal of these chemicals. It's hard to find reliable and up-to-date answers to questions about mordant safety. To compile this article, I had to draw upon a variety of sources including chemical lab manuals, industrial safety handbooks, medical accounts of accidental poisoning and directories of toxic substances. Given below are quick summaries of what I found. Learning more about the metallic salts we dyers use as mordants reminded me to treat them with respect but reassured me that careful dyers are not likely to harm themselves or their environment.

For your own safety and the safety of those around you, always follow these general rules. Keep mordants in labeled containers. Store them out of reach when not in use. Be careful not to inhale dust-fine particles when measuring mordants. Wear rubber gloves and avoid skin contact with mordant powders or solutions. Wash mordanted yarns thoroughly with soap and water. Never use the same containers and implements for mordanting, dyeing and cooking. Use separate equipment for dyeing, label it clearly and store it away from the kitchen.

Proper disposal of dye wastes depends on the mordants and quantities involved. Remember that the purpose of mordanting is to fix the metal to the fiber; there shouldn't be much mordant left over.

Measure accurately and use the minimum required. There's little danger from disposing occasional small batches of used alum, tin, iron or copper mordant baths onto the ground (always keep a distance from wells or waterways); chrome may pose a hazard. If you do a lot of dyeing and must frequently dispose of large quantities of waste, ask your local water or waste-control agency for advice. Many communities now sponsor an annual hazardous waste collection day, when households can bring cleaning solvents, automotive fluids, pesticides, dry-cell batteries, photographic chemicals and hobby supplies such as mordants for special handling and disposal.

Background on the Most Common Mordants

ALUMINUM Aluminum is a good mordant for wool and silk and other protein fibers, and is used in combination with tannins for cotton and flax and other cellulose fibers. The aluminum salt most frequently used as a mordant is potassium aluminum sulphate, or alum, a white powder. (Another kind of alum, ammonium aluminum sulphate, is less desirable.) Using aluminum dye vessels has some effect in brightening dye colors, but not enough aluminum dissolves to serve as a mordant.

Alum is generally recognized as safe to handle. It is an ingredient in deodorant, foot powder and styptic pencils. Ingesting a small amount causes dryness

and a puckering sensation in the mouth and throat. Larger doses cause vomiting or diarrhea, but few if any fatalities have been attributed to alum.

Gardeners use alum as a soil acidifier for acid-loving plants such as rhododendrons, azaleas, camellias or blueberries. Used alum mordant baths can be poured on the ground, but don't overdo. Repeated application can build up concentrations of aluminum which are harmful to plants.

TIN Stannous chloride (tin chloride) is the tin compound used in mordanting. It occurs as white crystals or flakes. Tin brightens colors, particularly reds, oranges and yellows. Too much tin makes wool or silk brittle and fragile. To avoid this, some dyers use just a pinch of tin, added at the end of the dyeing, on wool premordanted with alum. Dyeing in tin cans (which are really tin-plated steel cans) or tin-plated pots doesn't dissolve enough tin to suffice as a mordant.

Tin is generally considered non-toxic to humans. The human body tends not to absorb tin; for example, the small amount dissolved in canned foods is readily excreted. Ingesting a sip of a tin mordant solution would cause nausea and diarrhea, but is unlikely to be fatal. On the other hand, be aware that chlorine is a poisonous gas. When you dissolve tin chloride in water, it gives off fumes which can irritate your eyes, nose, and skin. Work in a well ventilated area or use an exhaust fan to carry away the chlorine fumes.

It is safe to dispose of occasional batches of tin mordant by pouring the liquid on the ground. The chlorine will evaporate, and the remaining tin is no more harmful than tin cans.

IRON Traditional dyers used iron-rich muds or water as a mordant, or simmered their dyebaths in iron pots. These methods are still effective, but modern dyers often use iron sulphate, sometimes called copperas, for an iron mordant.

Iron sulphate is a greenish powder. As a mordant, iron is used to make dark colors, often producing dark greens, grays or even black. Unfortunately, using iron often weakens fibers, and iron-mordanted yarns become brittle and deteriorate over time.

Most people feel comfortable with iron because it's a familiar metal, and many forms of iron, including iron oxide, or rust, are quite harmless. The effect of iron sulphate, however, is critically dependent on the dose. Iron sulphate is the same form of iron that's used in iron tablets. Iron is an essential constituent of the human body, necessary for hemoglobin formation. An adult human's body contains about 3.5 grams of iron, of which one to two grams are lost daily. But in children and adults, as little as 5 to 10 grams of iron sulphate can be fatal. Acute poisoning from accidental ingestion of iron tablets affects 2000 children a year: Only aspirin poisonings occur more frequently. Iron poisoning is dangerous because iron is readily absorbed, not excreted, and the concentrations build up to high levels. The symptoms are severe gastric disturbance, followed by headache, delirium, convulsion and death. The bottom line is this: Treat iron sulphate with as much respect as you give other mordants.

Plants need iron, and gardeners use iron sulphate to correct iron deficiencies and also to acidify the soil. Broadleaf evergreens are especially likely to show iron deficiency — their leaves get yellow, and growth is stunted. It's safe to dispose of occasional batches of iron mordant by pouring the liquid around the base of hollies, rhododendrons and other evergreens.

COPPER As a mordant, copper is used like iron, to darken or "sadden" the dye colors. Copper is less harsh on the fibers than iron. Simmering dyebaths in a copper pot adds enough copper to make a difference in the color, and can be used

in combination with alum mordant. Dyers without a copper pot use copper sulphate, also called blue vitriol, as a copper mordant. Copper sulphate forms brilliant blue crystals.

The human body needs a trace of copper; it functions in enzymes and in the nervous system. However, ingesting even a swallow of copper sulphate solution causes violent vomiting, generally within 15 minutes. Too much copper causes severe, irreversible damage to the liver and kidneys. Ingesting six grams of copper sulphate is likely to be fatal to an adult. Also, contact with copper sulphate may cause allergies and irritation of the skin, eyes and upper respiratory tract.

Handled with respect, copper sulphate is a very useful chemical. Gardeners sometimes add it to peat or muck soils which are deficient in copper, necessary for plant growth. More commonly, copper sulphate is used as a fungicide to control blights, mildews and leaf spots. The United States as a whole uses over 35,000 tons of copper sulphate annually — for agricultural fungicides and fertilizers, in metal finishing and wood preservatives, to control root growth in sewers, and to kill algae in water supplies. It's safe to dispose of occasional batches of copper mordant by pouring the liquid onto the ground.

CHROMIUM The form of chromium most frequently used as a mordant is potassium dichromate, an orange powder. It gives bright colors, and makes wool feel soft and silky. Chromium occurs in several forms that pose different health risks. The hazard of exposure to different chrome compounds is a subject of much controversy.

As adults, our bodies contain approximately six grams of chromium. It is essential for the production of insulin, and also affects protein synthesis. The food in a normal diet supplies adequate chromium, mostly in a form which passes through the body and is excreted. How-


ever, ingesting as little as 0.5 grams of potassium dichromate — the form of chrome used for mordanting — can cause kidney failure, coma and convulsions. It's estimated that six to eight grams of potassium dichromate would be a fatal dose for an adult, although there are no records that this kind of poisoning has ever occurred.

It's not well known that chromium is one of the most common causes of skin allergy, especially among industrial workers. Exposure to the chromium in cement dust, primer paints, auto anti-rust coating, detergents and bleaching agents can cause skin rashes and skin ulcers — recessed spots that heal slowly, although they are not painful and are not permanent. Inhaling the dusts and fumes of chromium compounds can cause respiratory problems and may cause lung cancer. Most of the hazards of chrome exposure have been reported from sites where factories have deposited huge piles — up to two million tons at one site in New Jersey — of chrome wastes. I could find no reports of serious symptoms experienced by hobby dyers who use an ounce or two of potassium dichromate now and then.

For guidelines on disposing of a used chrome mordant bath, contact your local authorities. Some municipalities would consider it a hazardous waste requiring special disposal, and others would not. ~

FURTHER READING

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- NIOSH: *Pocket Guide to Chemical Hazards*. National Institute for Occupation Safety and Health, Cincinnati, Ohio, 1985.
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GETTING STARTED WITH DYEING

RITA BUCHANAN

Little equipment is needed for dyeing, but mark each piece with indelible labels, and *don't* use the same equipment for cooking. Store the equipment in a safe place, out of reach of children. You'll need:

- a stainless steel or enamel pot that can hold several gallons of liquid;
- wood or metal rods for stirring the dye-bath and handling the fibers;
- scales for weighing fibers, dyestuffs and mordants;
- a set of measuring spoons and cups;
- a wire mesh strainer;
- a candy, dairy or scientific thermometer to use in the dye-bath;
- rubber gloves;
- a stove, hotplate or other heat source;
- a well-ventilated work area.

Wool is the easiest natural fiber to dye. It absorbs and retains colors well, and isn't too much trouble to handle. If you're new to dyeing, I'd recommend that you start with white or "natural"

wool yarn. First wind it into skeins about a yard in circumference, and weigh them with a postal scale — two to four ounces makes a good size skein. Tie the two ends of the yarn together in a bow or knot, leaving tails a few inches long, and use three or four pieces of string to tie loops around the skein to prevent its tangling. For the dye to penetrate evenly, the yarn must be clean, so remove any oils or finishes by washing it in warm water and liquid dishwashing detergent. Then rinse it in warm clear water.

Many dyes give better results if the yarn is treated with a small amount of a metallic salt, called a mordant. Mordants based on aluminum, tin, chrome, copper and iron are available through crafts stores and chemical supply houses. Handle mordants with care, and keep the labelled containers in a safe place out of the reach of children. Using different mordants increases the range of colors that you can get from a single dye plant,



Yarns dyed from plants grown in the author's garden.

but I use alum (potassium aluminum sulphate) far more often than I do any of the others. It is nontoxic and readily available, and it doesn't make the wool harsh as some other mordants do.

To mordant wool, use a big pot and allow at least four gallons of water per pound of wool. For one pound of wool, measure out four tablespoons of alum plus four teaspoons of cream of tartar; *or* one tablespoon of chrome; *or* two tablespoons of copper; *or* two tablespoons of iron; *or* two teaspoons of tin. Dissolve the measured amount of mordant in a cup of boiling water, add it to the pot of water and stir well. Add wet wool, heat slowly to a simmer and simmer for an hour. Set the pot off the heat and let it cool for several hours until it is lukewarm. Remove the wool and rinse well, then dye it immediately or dry it to store for future use.

The depth of color depends on the kind of plant and the relative quantities

of plant and yarn. Some plants give much more color than others. I usually start with a 4:1 ratio of fresh plants to wool (by weight), because I like rich colors. Using less dyestuff gives lighter colors. To make a dyebath, put the plants in the dyepot and cover it with water. Heat to just below boiling and simmer for at least an hour. With fresh soft plant parts such as flowers and leaves, I usually strain off the dye liquid right after boiling and proceed with the dyeing. Hard parts such as roots, bark or nut hulls release more color if you let the pot cool overnight and drain off the liquid the next day.

Finally, place the mordanted wool in the dyebath. Bring it slowly to a simmer and maintain for an hour. Remove at once or let the yarn cool in the dyebath overnight for darker colors. Wash and rinse the yarn until the color stops bleeding, then squeeze out excess moisture and spread or hang the yarn to dry. ❖

A N A T U R A L D Y E I N G B I B L I O G R A P H Y

ANNE BLISS

Adrosko, Rita J. (1971) *Natural Dyes and Home Dyeing*. New York: Dover Publications, Inc. (154 pages) and Furry, Margaret S. and Bess M. Viemont *Home Dyeing with Natural Dyes*.

This combined book features historical dye methods and plants used by American colonists.

Bemiss, Elijah. (1973) *The Dyer's Companion*. New York: Dover Publications, Inc. (313 pages)

This book is a complete reprinting of Bemiss's original 1815 text on natural dye methods and how to produce over 100 shades on wool, linen, and cotton.

Bliss, Anne. (1981) *A Handbook of Dyes from Natural Materials*. New York: Charles Scribner's Sons. (180 pages)

Recipes from across the U.S. are presented in cookbook format in this book with both black and white and color illustrations. Some history as well.

Bliss, Anne. (1986) *North American Dye Plants*. Boulder, CO: Juniper House. (288 pages)

The pocket or backpack sized format of this book make it ideal for foraging trips as well as easy to use in the dye area. 126 plants are illustrated with instructions for mordanting, dyeing.

Bronson, J. and R. (1977) *Early American Weaving and Dyeing*. New York: Dover Publications, Inc. (204 pages)

Although this book was published nearly 200 years ago, most of the information is still useful to the home artisan. The dye recipes are interesting reading, and they work!

Buchanan, Rita. (1987) *A Weaver's Garden*. Loveland, CO: Interweave Press, Inc. (230 pages)

Although this book includes more than just dye plants, the chapter on dyes from plants is a thorough introduction to growing traditional favorites such as

weld and indigo as well as to methods for using them.

Davidson, Mary Frances. (1981) *The Dye Pot*. Rt. 1, Gatlinburg, Tennessee: Author. (27 pages)

This booklet is a classic "how to" for dyers. Chock-full of useful, basic information, the book lists plants alphabetically with color possibilities obtainable by using various methods.

De Boer, Janet, Ed. (1987) *Dyeing for Fibres and Fabrics*, rev. ed. Kenthurst, Australia: Kangaroo Press Pty. Ltd. (112 pages)

Although this book is intended primarily for Australian dyers, the information provided by the 21 dye experts who have written on techniques and uses for dyes is useful around the world.

Fraser, Jean. (1989) *Traditional Scottish Dyes*. Edinburgh, Scotland: Canongate Publishing Ltd. (106 pages)

This book gives recipes for 75 plants, most available in North America. Basic information about methods, parts of plants to use, and color yields from various mordants is provided.

Hurry, Jamieson B. (1973) *The Woad Plant and Its Dye*. Clifton, N.J.: Augustus M. Kelley Pub. (328 pages)

Reprinted from Oxford University Press's original 1930 edition, this book presents a comprehensive history and botanical information about the woad plant. Recipes and methods are given.

Kierstead, Sallie Pease. (1972) *Natural Dyes*. Boston: Branden Press Publishers. (104 pages)

Basically a "how to" book, this text gives general information about plants and various methods to use with them.

Miller, Dorothy. (1984) *Indigo from Seed to Dye*. Aptos, CA: Indigo Press.

This book is a delightful essay on the virtues of indigo, and it provides good background on Japanese use of indigo-bearing plants to produce traditional as well as contemporary textiles. The author tells how to set up a vat and use it, and even supplies a coupon in the book that may be exchanged for a free packet of "indigo seeds" from *Polygonum tinctorium*.

Rice, Miriam and Dorothy Beebe. (1980) *Mushrooms for Color*. Eureka, CA: Mad River Press. (154 pages)

Here's an interesting book that not only tells how to collect mushrooms, but how to use them to produce wonderful colors on silk and wool.

Sandberg, Gosta. (1989) *Indigo Textiles Technique and History*. Asheville, NC: Lark Books. (184 pages)

This English-language version of the original Swedish book published in 1986 is a gem. Delightful history, beautiful colored photos, and the best assortment of uses for indigo I've seen in a book for home dyers are gathered together in this volume.

Young, Stella and Nonaba G. Bryan. (1978) *Navajo Native Dyes*. Palmer Lake, CO: Filter Press. (unpaged)

Originally published by the U.S. Bureau of Indian Affairs, this little book describes methods developed to teach the Navajo how to use native dyestuffs found on the reservation. Although many of the original methods had been lost in the 100 years previous to the 1940 issue, some dyers were still practicing. ❖

SOURCES OF DYE SUPPLIES AND DYE PLANTS

Mail-Order Suppliers of Dyestuffs and Mordants

ALLIANCE IMPORT CO, 1021 R. Street,
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BATIK AND WEAVING SUPPLIER, 393 Mas-
sachusetts Ave., Arlington, MA
02174; (617) 646-4453.

BROOKS AND FLYNN, P.O. Box 2639,
Rohnert Park, CA 94928; (800)
822-2372; in CA (800) 345-2026.

BRYANT LABORATORY INC., 1101 Fifth St.,
Berkeley, CA 94710. (415) 526-
3141.

COUPEVILLE SPINNING AND WEAVING
SHOP, P.O. Box 520, Coupeville,
WA 98239; (206) 678-4447.

CREEK WATER WOOL WORKS, P.O. Box
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3302.

DBP UNLIMITED, P.O. Box 1344, Duarte,
CA 91010; (818) 357-8677.

DIANA'S DESIGNS, 7011 Spieth Road,
Medina, OH 44256; (216) 722-
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EARTH GUILD, One Tingle Alley,
Asheville, NC 28801; (800) 327-
8448.

THE MANNINGS, P.O. Box 687, East
Berlin, PA 17316; (717) 624-2223.

RIO GRANDE WEAVER'S SUPPLY, P.O. Box
2009, Taos, NM 87571; (505)
758-0433.

TESTFABRICS, INC., P.O. Box 420, Mid-
dlesex, NJ 08846; (201)
469-6446.

Mail-Order Suppliers of Dye Plants and Seeds

FLOWERY BRANCH, PO Box 1330, Flow-
ery Branch, GA 30542

FORESTFARM, 990 Tetherow Rd.,
Williams, OR 97544

GOODWIN CREEK GARDENS, Box 83-C,
Williams, OR 97544

DOROTHY MILLER, 5950 Fern Flat Road,
Aptos, CA 95003 (indigo seeds)

NATIVE SEEDS/SEARCH, 3950 West
New York Drive, Tucson, AZ 85745
(indigo seeds)

RICHTER'S HERBS, Goodwood, Ontario
LOC 1A0 CANADA

SANDY MUSH HERB FARM, Rt. 2, Surret
Cove Rd, Leicester, NC 28748

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WORLD SEED SERVICE, PO Box 1058,
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INDOOR BONSAI

PLANTS & GARDENS

BROOKLYN BOTANIC
GARDEN RECORD



PLANTS & GARDENS

BROOKLYN BOTANIC GARDEN RECORD

I N D O O R
B O N S A I

1990



Brooklyn Botanic Garden

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INDOOR BONSAI

VOL. 46, No.3, AUTUMN 1990

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LETTER FROM THE BROOKLYN BOTANIC GARDEN

Indoor bonsai began as a purely American idea, and BBG's former bonsaiman, Frank Okamura, was largely responsible for its general acceptance in the last two decades.

Bonsai courses have been conducted at the Botanic Garden since 1952, and in those early days students came from great distances to attend them. The plants provided were the classic Japanese species of pine, *Chamaecyparis*, maple, azalea and Zelkova. Gradually others were introduced. It soon became clear to the instructors that many local students were apartment dwellers who did not have outdoor cold-frames for overwintering hardy trees and that it was necessary to give them tropical or subtropical woody plants — which would survive central

heating — to work on.

In the meanwhile, Frank Okamura was experimenting with many different plants: *Malpighia coccigera*, pomegranate, *Serissa foetida*, Citrus species, *Pyracantha*, boxwood and a hundred others. Eventually his collection of indoor bonsai varieties was large enough for a major exhibit. The two-week show attracted several thousand people during a snowy February in 1976.

The original handbook, guest edited later in 1976 by the late Constance Derderian (a "regular" in BBG courses), was a direct result of the evident interest in indoor bonsai. It has gone through 21 printings since then, and reached countless thousands of bonsai enthusiasts in many parts of the world.



Ficus benjamina 'Exotica', Exotic Fig Tree.

This year, BBG's Editorial Committee decided to publish an entirely new Handbook with articles by creators of tropical houseplant bonsai from many parts of the United States and other countries. Sigmund Dreilinger, another of BBG's early students, kindly consented to act as Guest Editor. Through his connections as President of Bonsai Clubs International he has been able to solicit articles from many knowledgeable bonsai growers. We thank Mr. Dreilinger and the contributors and hope you will be challenged to create your own bonsai after reading the words of those who have been doing so for many years, thanks to Mr. Okamura's leadership.

ELIZABETH SCHOLTZ
DIRECTOR EMERITUS

BASIC CONSIDERATIONS FOR GROWING INDOOR BONSAI

PHIL TACKTILL

An indoor bonsai is any woody plant trained as bonsai and capable of surviving the rigors of the indoor environment. In order to grow bonsai indoors, we must first understand the different plants used for bonsai and what they require to survive in their natural habitat. It then remains to alter the indoor environment to approximate the natural growing environment as closely as possible. The following is a list of factors one should consider:

Types of Materials

- **TROPICAL BONSAI:** plants requiring a warm environment to survive; unable to withstand a freeze.
- **BORDERLINE HARDY:** plants unable to withstand long periods of cold.
- **BROAD RANGE:** plants able to withstand extremes of hot and cold.
- **WINTER HARDY:** plants requiring a cold

environment for a prolonged period of dormancy.

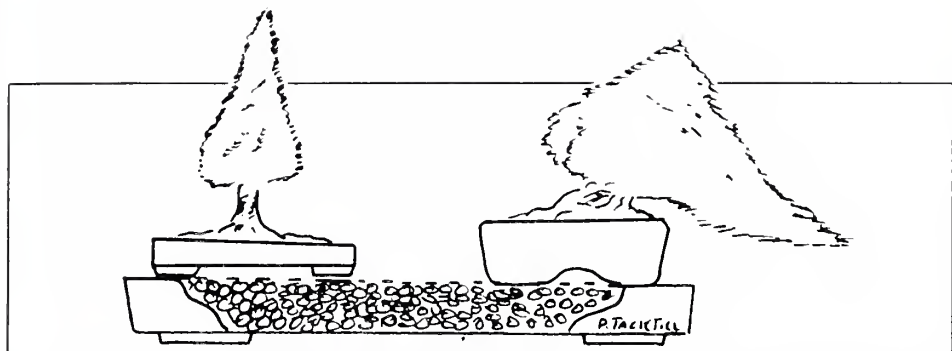
There are many charts available showing growing zones for different plants. Be aware that they refer to plants growing in the ground, not in containers. The roots on many trees are not able to withstand cold, nor the trunk and branches above ground. In bonsai containers, the exposure is multiplied and must be taken into account when planning which materials will be grown or maintained in which environment.

Almost all the aforementioned materials can be grown indoors if we provide the proper conditions. Here are some suggestions on how to provide a microenvironment suited to individual needs of the plants and their owners:

Increasing Humidity

- Spray foliage with an antitranspirant such as Wiltpruf, Envy or Evergreen. This provides a direct greenhouse effect on the foliage and is particularly useful after repotting to reduce moisture loss through the leaf surface.

PHIL TACKTILL, owner of Jiu San Bonsai Co. in Farmingdale, N.Y., has been teaching bonsai classes for 20 years and has lectured and written extensively on bonsai.



- Set the bonsai container on a tray of gravel and water. The evaporation of water provides local humidity to the plant. The drainage holes in the bonsai container must be above the water level in the tray so that normal drainage of the soil is unimpeded.
- Use a humidifier. A cool mist vaporizer is also a good source of humidity in a smaller room, as is the standard warm mist vaporizer if the indoor temperature is kept quite cool (below 65°) in winter.
- Enclose the area in plastic. Any method of stretching plastic over a frame of wood, plastic tubing, or metal strips is workable indoors. Small tents for single trees or a collection of small bonsai, to larger indoor areas can be very successful as housing for tropics.

Providing Air Movement

You can provide air movement with one or more fans, depending on the size of the indoor growing area. Or open a

INDOOR

HUMIDITY:

Extremely low due to air-conditioning or heating (10 to 20 %). The Sahara Desert is about 30%.

AIR MOVEMENT:

Poor movement.
Insects and fungi thrive.

LIGHT:

Poor at best.

TEMPERATURE:

Stable, controllable.

OUTDOOR

In high coastal area, humidity is 40 to 80 %.

Usually good air movement—often variable.

Good to full sun.

Variable with extremes.

window, providing the outdoor air is not too cold. This is a good method in the in-between times of the year when the day-time temperatures are warming up but the nights are too cold for plants. Bonsai should never be exposed to drafts directly in front of a window in winter. Plastic can be used as a barrier if storm windows are not used or are ineffectual in keeping out even slight frigid drafts.

Regulating Temperature

Temperature can be altered to meet bonsai needs. When higher temperatures are needed, a thermostatically controlled space heater can be used. Sources of dry heat such as this should almost always be used in conjunction with a humidifier or other source of moisture in the air.

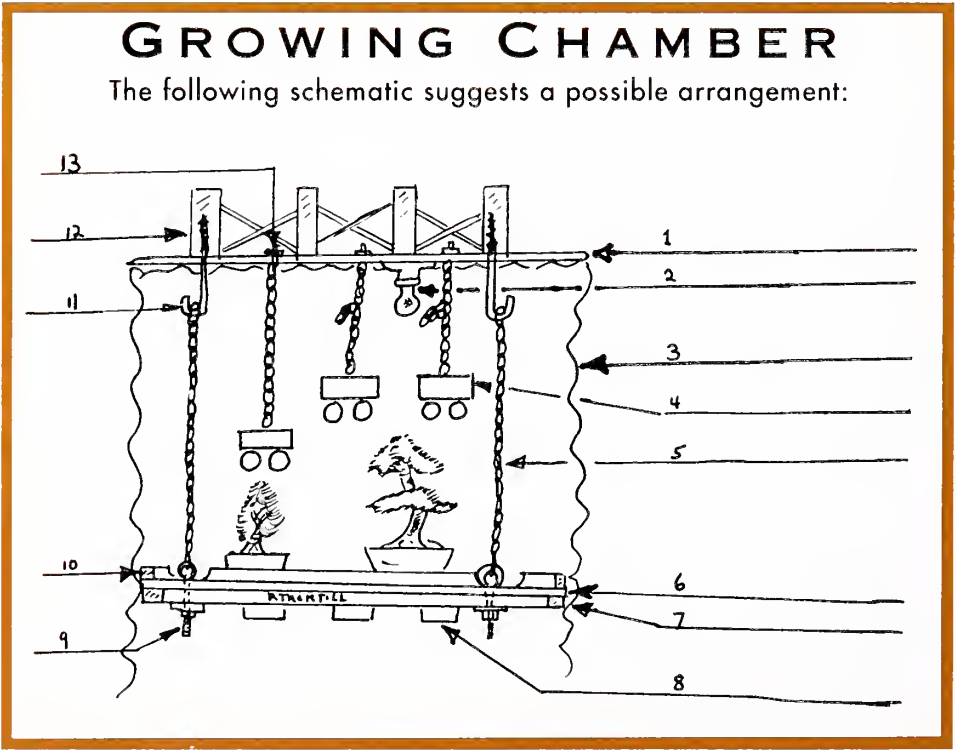
Those who grow indoors in warmer climates can use the refrigerator as a source of cold for trees needing a dormant period. Keep in mind that dormant trees do not need light and can be enclosed in the darkness of a refrigerator. Refrigerators remove moisture, however, and it is a good idea to spray the tree(s) with a fungicide and enclose it in plastic before refrigerating it.

Providing Light

Place bonsai near a window or in a greenhouse.

Provide artificial light with fluorescent cool white or daylight bulbs for sixteen to eighteen hours a day.

A 4' x 8 3/4' sheet of marine plywood (#6), reinforced with a 2" x 3" or 2" x 4" board rimmed with a 1/2" square strip





Malpighia glabra bearing both flowers and fruit, from the Guest Editor's collection.

PHOTO BY SIGMUND DREILINGER

(#7 and 10) forms the floor of the chamber. Paint the surface with epoxy, marine or urethane paint, preferably white to reflect light. This will preserve the wood.

A lighting fixture chain (#5) can be hooked to an eye bolt with nut and washer (#8 and 39), and the top hook can be screwed into the rafters (#11, 12 and 13). Lamps can be suspended by chains so that they can be raised or lowered (#4). Incandescent bulbs can be mounted to the ceiling (#2). One incandescent bulb should be used for each sixteen feet of fluorescent tube. Three fluorescent tubes can be accommodated in the ceiling of the chamber, or suspended by chains from a 2x3 or 2x4 nailed to the rafters (#1). The lamp chains are mounted to

the 2x4 with eye screws or bolts. The ceiling of the chamber should also be painted white to maximize reflection of light.

A plastic drop cloth should be used to enclose the assembly (#3). The base or ballast of the chamber, being remote from the fixtures and suspended, allows for additional circulation underneath the chamber.

These suggestions are basic considerations for supplying indoor bonsai with essential environmental needs. Common sense applied to individual circumstances enable the grower to make necessary modifications, and to invent specific methods to suit his or her lifestyle. 🌱

REPRINTED WITH PERMISSION FROM *WORLD TROPICAL BONSAI FORUM*.

ILLUSTRATED GUIDE TO STYLES

FRANK OKAMURA



Informal upright (Moyogi) style
with Shari branch
(dry part within foliage).



Slanting style with gnarled Shari
trunk (aged dead wood).

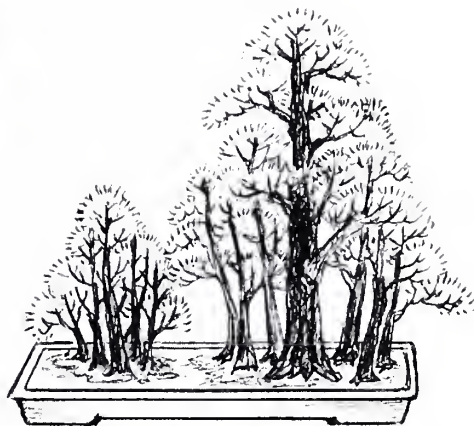


Slanting style with Jin.

FRANK OKAMURA is former Bonsaiman at BBG. He was responsible for BBG's bonsai collection and is well known in bonsai circles.



Forest style. Illusion of distance by sloping. Suggestion of mountains.



Two-group style. Suggestion of two human families.



Clinging upright style with driftwood or stone. Imagine a tree holding onto a rock in a gorge.



Group slanting style.

ONE GROWER'S TIPS FOR SUCCESS WITH INDOOR BONSAI

JACK WIKLE



Buxus microphylla 'Compacta' grown under fluorescent light for nine years.



Cotoneaster microphylla, ten years old, under lights for seven years.

My personal experiments in growing bonsai under lights began tentatively. Following the books' recommendations to keep the plants as close to the fluorescent light source as possible, I lowered the shop light over my basement workbench to six or eight inches above its surface. Then I brought in two small firethorns (*Pyracantha*) from the garden, pruned them hard, potted both in tiny bonsai pots and installed an economical timer set to turn the fluorescent light on 16 hours a day. This was the beginning of what has become a rewarding experience—growing and enjoying fluorescent light bonsai.

JACK WIKLE, M.S. in Ornamental Horticulture, author of articles on bonsai and other subjects, lives and works in Michigan.

Actually, it has seemed embarrassingly easy, far easier than outdoor bonsai culture so subject to temperature extremes, light intensity fluctuations and vagaries of wind and rainfall. I want to insist that if I can do it, you can too. But I must say that some people have rewarding experiences following my suggestions while others give up in frustration.

It's important to emphasize that even indoor bonsai require daily attention. This is not just being alert to insect infestations but also shifts in vigor or other evidence of change in the plant's well-being.

Many new indoor bonsai growers also fail to give the newly potted or repotted plant special attention during its recovery phase. This means watering well immediately after potting, then setting

the pot on a folded towel or sand bed to absorb excess water, thus letting more air into the soil mix. Roots require oxygen; every living cell must receive oxygen to survive. Even roots that are immersed in water must have oxygen to take water up efficiently. And the soil physicists tell us that oxygen diffuses some 10,000 times faster through air than it does through water. This is why a plant wilts in overly wet soil.

Special attention also means enclosing the newly potted tree in a transparent polyethylene bag—such as a food storage Baggie—to create an enclosure with 100% humidity in which the tree cannot dry out as it is adjusting. This works very well under fluorescent light but don't put the bagged plant in direct sunlight as heat buildup will quickly fry everything.

Another word of caution: The plant accustomed to the soft life in a high humidity chamber has many adjustments to make when the bag is removed and life in the outside world begins. To avoid severe damage or death, a "programmed re-entry" works well. The first day out, remove the bag for 15 minutes or a half-hour at most. Then each succeeding day double the time. (If you lack a dependable "sitter" to care for your fluorescent light bonsai while you are on vacation, the same bagging technique can be temporarily used. Water each plant well, enclose it completely in a polyethylene bag and set it back under the fluorescent light. I've done this for two weeks. Follow the programmed re-entry procedure again when you return—30 min., 1 hr., 2 hrs., etc. Also see E.O. Moulin's article, page 36)

After the first watering of the newly potted bonsai (by setting it in water up to the lip of the pot), it will not need any more water if kept from drying in a polyethylene bag for five to ten days as it

begins its recovery. It is when it is finally out of the bag that the most difficult water decisions occur. Since the plant is weak and root distribution is probably erratic, some of the water in the soil may be unavailable. So it's best not to wait for the soil to become visibly dry in this case. It is a difficult balancing act. You want the soil to dry—to increase oxygen availability—but not too much. As one student reacted, "I see what you're saying. You let it go until it's dry then water the day before." Yes.

After the tree has clearly recovered from the potting or repotting operation, close observation of wetting and drying patterns continues to be important. The tree that won't wait another day must be watered. But equally important, it's best to withhold water to prevent overmoist soil if it seems a tree could go another day without damage from drying. Although some plants are quite content in constantly moist soil, many others are actually healthier and grow better if allowed to dry between waterings. Once more, roots require oxygen as well as water and since plants have no circulatory system like we do for transporting oxygen, roots must take it up from air in the soil around them.

Watering the newly potted bonsai without washing away most of the fresh, and thereby unstabilized, soil can be a problem. One approach is to use a misting bottle that produces a very fine spray. Another, and the one I favor, is to use a basting syringe for quick watering but precise control, thus avoiding erosion of the soil mix.

After the plant is well established and the soil mix has firmed, my watering technique is "quick dip and flush." I wet the soil mass by immersing it in plain water, then follow up immediately by pitcher-watering with a weak fertilizer solution. You can't find a pitcher with a fine

enough spout to use with small bonsai? I couldn't either. Then I realized I could adapt the common, plastic household watering pitcher to my needs by epoxying a small button to the tip of the spout.

One reason for running fertilizer solution through the soil is that there can be problems without regular leaching (flushing out) of minerals the plant can't use. Salts begin to accumulate at the soil surface. If moss is growing on the soil, it begins to die. Eventually the tree suffers too. Regular surface watering (make certain that water flows freely from the pot's drain holes before you finish) avoids this problem. Since city water is hard, I use rain water or water collected from a dehumidifier. When I run out of both, I used melted snow. My feeling is that bonsai can be grown indoors using water from the tap but it's more difficult.

Fertilizing is an ongoing process. Each time I water—unless I'm in a big hurry—the trees receive a light dose. How weak? I've been using products like Rapid-gro, Miracid, Wonder-gro and Peters 20-20-20 at a rate of one teaspoon in five gallons of water. Regular application makes up for the low concentration. Keep in mind, however, that even this very mild solution can kill dry plants. I've demonstrated this repeatedly. Water the dry plant with plain water first, then apply the fertilizer.

Incidentally, withhold fertilizer on the newly potted or repotted tree until it has definitely begun growing and is well on its way to recovery. The weak tree is more likely to be damaged than "saved" by fertilizer.

The ideal soil mix is an unresolved issue. Practicing bonsai enthusiasts certainly don't agree on a "best" recipe but do agree that soil is important. The goal is a growing medium with lots of internal "spaces" between the particles, spaces large enough to admit water read-

ily and at the same time let excess moisture escape (allowing air to re-enter the soil). Of course, enough water should be retained to meet the plant's needs.

One way to obtain these internal spaces is to screen the mix ingredients before they are combined. Use a standard window screen and throw away anything that goes through the screen. Screening may be more important than the choice of ingredients.

Lacking a "best" recipe, one can do much worse than the time-honored horticultural blend of one-third coarse sand, one-third sphagnum peat and one-third "good garden soil" (all by volume). The preferred soil is a sandy loam. Avoid anything clayey. Packaged potting soils are quite variable in composition and quality so it may be best to use them only as a substitute for "good garden soil" in the 1:1:1 ratio mix, if they are used at all.

The combination I currently favor is one part grit ("starter" chicken grit from the feed and farm supply store) or sand, two parts sphagnum peat (available at garden centers) and three parts Turface (a commercial horticultural product consisting of baked clay particles).

Another consideration is inadequate light as a result of not keeping the bonsai close enough to the fluorescent unit. Light intensity diminishes very rapidly with increasing distance from its source. Accordingly, the uppermost parts of one's tallest bonsai should almost be brushing the tubes. My personal guideline is that no part of any tree should be further than 12 inches away. Since the light output of a fluorescent tube drops greatly with extended use, it's a good practice to replace the tubes once a year. Replace one tube in a fixture, then replace the second tube a few days later to avoid any damage to plants sensitive to the light increase.



Plant selection is the final issue. The first plants I brought indoors were some familiar outdoor kinds—such as firethorns, cotoneasters and boxwoods—which I thought would not require annual cold-dormancy to thrive.

Then I began receiving gifts of subtropical and tropical plants from friends. Sometimes I received a cutting, sometimes a small plant newly established in a plastic

container; in most cases, the types of plants that would not survive winters outdoors in Michigan. I have enjoyed becoming acquainted with these "foreign" plants.

I have a Top Ten List for indoor bonsai—boxwoods (*Buxus* species), cotoneasters (*Cotoneaster* species), false heather (*Cuphea hyssopifolia*), figs (*Ficus* species), English ivy (*Hedera helix*), Greek myrtle (*Myrtus communis*), firethorn (*Pyracantha*



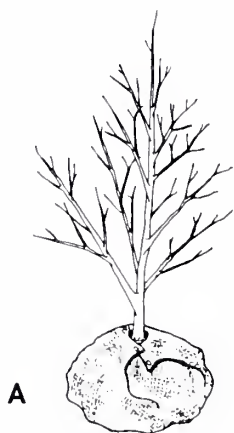
Juniperus procumbens 'Nana', three inches high, a 14-year-old cutting grown under lights for nine years.

coccinea), azaleas (*Rhododendron* species), Chinese sweetplum (*Sageretia thea* [*S. theezans*]) and serissa (*Serissa foetida*)—but believe me experimentation is a great deal of the fun in bonsai growing. The more kinds you try, the more fun you'll have and ultimately, the more bonsai you'll have. 🌳

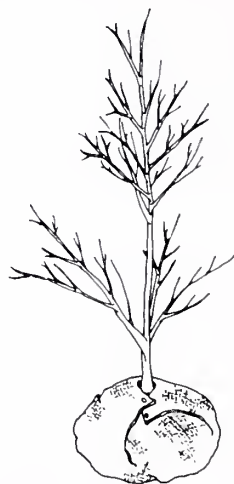
EDITOR'S NOTE: CULTURAL INFORMATION ON MR. WIKLE'S TOP TEN MAY BE FOUND THROUGHOUT THIS HANDBOOK.

WHAT MAKES A GOOD BONSAI?

- ❶ The container is of a style, shape and color to complement the style of the tree.
 - ❷ The surface roots, if any, make a gentle pattern radiating from the base of the trunk. No roots are crossed one over the other, nor are any exposed in an extreme or unnatural manner unless this is in keeping with the style of the tree.
 - ❸ The trunk is positioned in the container in an aesthetically satisfying spot for its particular style. Approximately the first (bottom) third of the trunk is clearly visible, and the second third is partially visible. The trunk tapers from the earth to the tip of the tree. There are no abrupt or artificial changes.
 - ❹ The main branches are gracefully arranged left, right and rear of the trunk. The distance between them is of equal or nearly equal proportion on all parts of the tree. None crosses another.
 - ❺ The twigs which grow from the branches make delicate and precise patterns, all of about the same length. If there are training wires, they are applied neatly to both branch and twig. The wires are of a dull color so they do not disturb the overall effect more than necessary. A "finished" bonsai has no wires.
 - ❻ There is no evidence of stubs left from pruning or marks from wires, weights or other props used in training.
- (ADAPTED FROM **TROPICAL BONSAI**, AMERICAN BONSAI SOCIETY, 1967)



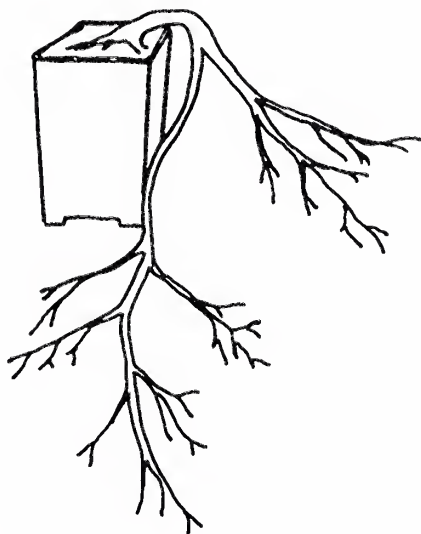
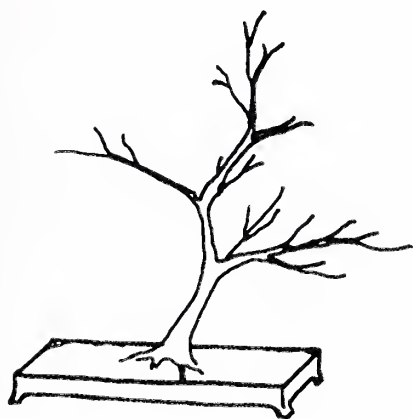
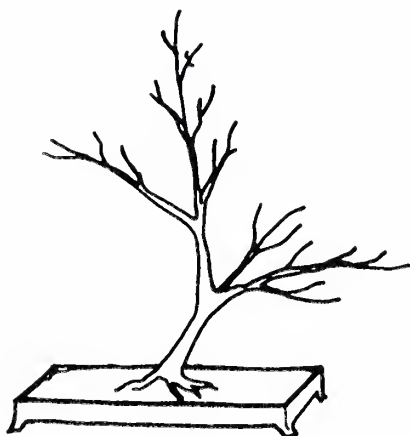
A



B

Two trees from nursery.

A shows more potential than B because of the more numerous, better spaced branches.





Small bamboo and *Juniperus chinensis* var. *sargentii*
from BBG's bonsai collection.

GROWING WITH ARTIFICIAL LIGHT

MARGERY M. CRAIG

Many indoor bonsai can be grown successfully under fluorescent light. In fact, plants often do better there because their cultural needs may be more easily met in the controlled environment of the light garden than in the varied conditions of windowsills around the home. Ideally, the light garden provides a winter growing area for subtropicals that have summered outdoors in full sunlight, but for apartment dwellers who have limited outdoor space, the lights can be used year-round.

Plants to Grow

A great variety of plants will adapt to fluorescent light culture. *Serissa* grows and flowers continuously during the winter months, while gardenia (*G. jasminoides radicans*), Barbados cherry (*Malpighia glabra*) and dwarf pomegranate (*Punica granatum nana*) also bloom, but less frequently. Plants native to very warm climates like bougainvillea bloom under fluorescents in late January; pyracanthas and azaleas from milder parts of the temperate zone bloom in early spring.

Among the evergreen plants that grow throughout the winter are podocarpus,

various cypresses, Japanese box (*Buxus microphylla*), weeping fig (*Ficus benjamina*), creeping fig (*Ficus pumila*), English ivy (*Hedera helix*), olive (*Olea europaea*), junipers and false-cypresses (*Chamaecyparis*). Other types of plants will rest for two or three months during the winter, then start active growth in early spring. Examples of these are Natal plum (*Carissa grandiflora*), willow-leaved fig (*Ficus nerifolia regularis*), *Camellia sasanqua*, brush-cherry (*Syzygium paniculatum*; often referred to as, *Eugenia myrtifolia*), Chinese elm (*Ulmus parvifolia*), limeberry (*Triphasia trifolia*), lantana and hibiscus.

The light garden may also be used to start cuttings and seeds for indoor or outdoor bonsai. A clear plastic box containing a two-inch layer of coarse, screened perlite makes a convenient cutting box as well as a good place to store fingertip-size mame (miniature) bonsai during long weekends and vacations. The perlite, which is moistened, maintains a humid atmosphere but is sterile so that damping-off or other fungus growth is seldom a problem. If there are two or three small holes in the top and in the bottom of this box for air circulation and drainage, mame bonsai can be kept alive for a week or two without attention. As a cutting box, it rarely needs any care. After the initial watering when the cuttings are made, it should be checked

MARGERY M. CRAIG, Brookline, Massachusetts. A research biochemist by profession, she has devoted many years to the study of bonsai.

monthly, but no additional water should be added unless the perlite is dry to the touch.

Design

The design of the light garden can be as varied and decorative as space and ingenuity allow. It has the great advantage of being flexible in size so that units may be added as desired. Commercial fluorescent units are available at garden centers for those wishing to design their own; most of the necessary materials are available at hardware or building-supply stores.

In choosing the length of fluorescent tubes, it is useful to remember that light intensity diminishes at the ends of any fluorescent tube. For this reason longer tubes are more efficient than shorter ones. The 48-inch tube is a convenient basic unit and the light garden may be made up of multiples of this readily available size.

A typical light system consists of two 48-inch tubes mounted in single strip fixtures spaced six inches apart on the underside of a shelf or stand 20 inches above a table or the shelf below. Two standard 11-by-22-inch waterproof plastic plant trays fit conveniently under each pair of lamps. To give varied distance to the lights for different size plants, one of the trays may be set up three to four inches on an overturned flat or on blocks of wood. The ballast from the fixtures may be removed and mounted separately to save space and reduce heat in the plant area. A reflector above the lights is not required if the shelf on which the tubes are mounted is painted with super-white flat paint.

Green plants cannot use all wavelengths of visible light. The red and blue ends of the spectrum promote plant growth and flowering, so fluorescent tubes which provide greater light intensity in these areas will produce more lush growth. I have found that Verilux Tru-

Bloom tubes are very satisfactory, as are the Gro-Lux Wide Spectrum bulbs. The improved deluxe cool white and warm white tubes now also have increased output in the wavelengths plants can use. For maximum growth the tops of the plants should be no more than four to six inches from the lights. An appliance timer set for 14 to 15 hours per day can be used to turn on the lights automatically.

Growth Requirements

The humidity required for healthy plant growth should be provided by placing a half-inch layer of pebbles in the bottom of the plant trays and keeping this covered with water. To prevent the soil from taking up this moisture, the pots should rest on a support above the level of the water. A convenient support may be made from "egg crate" nylon fluorescent light diffusers available at building supply stores. Saw it to fit snugly into the tops of the plastic trays which taper and support the diffuser above the water level. If the temperature in the growing area ranges between 60-65° F this arrangement will provide sufficient humidity. Some plants require greater heat and humidity. This may be obtained by taping a 75° F heating cable in the bottom of the trays before the pebbles are added.

The cultural requirement for successful light gardening with indoor bonsai is to have good air circulation both in the air around the plants and in the soil. The first need can best be met with small fans designed to run at low speed. One fan hung in each 48-inch unit moves enough air to keep the plants healthy. On the second point, the soil mix must be carefully prepared and proper attention given to watering only as often as the soil dries. This will vary with the size of the pot. Very small bonsai require water every day. Most larger plants need water only once or twice a week. ☁

TYPES OF FLUORESCENT TUBES

COOL WHITE & WARM WHITE

least expensive
average life – one year

AGRO LITE & WIDE SPECTRUM GROLUX

broad spectrum
expensive
longer life

VERILUX, VITALITE & G.E. CHROMA 50


broad sun spectrum
more expensive
much longer life – up to four years

**HIGH PRESSURE SODIUM,
LOW PRESSURE SODIUM
& SYLVANIA SUPER METAL ARC**
high intensity discharge
very costly

FOOT CANDLE READING WITH A PHOTO ELECTRIC EXPOSURE METER

Point the meter at a clean white paper at a distance of approximately 8 - 10 inches above the surface. Be certain not to cast a shadow from the light source on the paper. Set the meter at A.S.A. 10. With the exposure meter set for 1/100 of a second, the following are the foot candles:

METER READING	FOOT CANDLES
f 3.5	400 F.C.
f 4.0	500 F.C.
f 4.5	650 F.C.
f 5.0	800 F.C.
f 5.6	1000 F.C.
f 6.3	1300 F.C.
f 7.0	1600 F.C.
f 8.0	2000 F.C.
f 9.0	2400 F.C.
f 11.0	4000 F.C.
f 12.7	5200 F.C.
f 16	6400 F.C.



ARTIFICIAL LIGHT REQUIREMENTS FOR INDOOR BONSAI

JOCHEN PFISTERER

Plants used for indoor bonsai originate in warm climates. Plants of these regions have different care requirements when cultivated indoors.

• TROPICAL RAINFOREST

Weather in a tropical rainforest is not so humid as the name suggests. In the morning there is a hot and drying sun; the notorious tropical thunderstorm does not occur until afternoon. Young trees must grow in the shadow of their older neighbors.

With their adaptation to moist conditions and shallow light, plants of this cli-

mate are easily grown indoors. Their leaves accept dry air (central heating) because of a thick cuticle; artificial light of 700-1000 Lux* is sufficient as they are accustomed to half-light.

Ficus species and *Schefflera* are trees of this type; the tropical shrub *Polyscias* accepts dim light but its leaves require high humidity.

• SUBTROPICAL FORESTS

These forests are not so dense—sunlight comes down to the floor. Each year there are two rainy (monsoon) periods and two dry spells. During dry periods many trees drop their leaves. But coastal sub-

JOCHEN PFISTERER, owner of a bonsai nursery in Baden-Baden, Germany, is also a biologist, gardener, bonsai student and teacher, and author of many articles on bonsai as well as botany and ecology.

*To convert Lux to foot candles, the unit of light measurement more commonly used in the U.S., multiply by 0.4. For information on how to use a photo electric light meter to measure light available in a particular spot, see the chart on page 23.



A closet equipped with shelves and fluorescent lights can be adapted for growing bonsai.

tropical sites have no real dry periods and these plants need high air humidity all year. These include the well-known *Serissa*, *Ehretia* and *Sageretia* while *Ulmus parvifolia* accepts dry air better.

Subtropical plants need 2000-5000 Lux light and a higher air humidity (50% minimum).

• MEDITERRANEAN CLIMATE

Subtropical conditions prevail: Rainy periods in autumn and spring with a short dry spell in winter and a long dry and hot period in summer. Similiar climate is found in southern California, Chile, South Africa and the southwest coast of Australia. Typical plants are sclerophyllous shrubs and small trees like *Olea*, *Myrtus*, *Cistus* (Mediterranean), *Acacia*, *Callistemon* (Australia), *Phyllica* (South Africa), *Lippia* (Chile), *Schinus* (California). These plants accept dry air, but need brilliant light—up to 10,000 Lux. In winter place plant in southern window or add additional electric light.

• SUBTROPICAL SEMIDESERTS:

Plants from these dry regions, succulent and sclerophyllous plants, need bright light—more than 10,000 Lux. Their weak roots do not accept a wet soil; they must be watered cautiously. Trees of this climate include the well-known *Adenium*, *Crassula* and *Portulacaria*.

Lamp & Light Color Recommendations

The best light for any plant is normal sunlight in an open-air location, if temperature is sufficient. The best artificial light is that which copies natural sunlight and this is found in lights with a light yellowish white color.

Common filament lamps emit such color light, but only for our eyes. This lamp type also emits infrared light at a high level and infrared radiation means heat.

Aquarium operators know about lamp problems. They use fluorescent lamps in two

different light colors: WARM-LIGHT—a light yellow, and NORMAL-WHITE or DAY-LIGHT-WHITE—lights which contain all colors of the rainbow in equal concentration.

The pale-violet "PLANT LIGHT" recommended by the industry does not provide as good results as the light colors mentioned above. Leaves are green because of chlorophyll. This pigment absorbs the light colors red, orange and yellow, blue and violet. Green is reflected (this is why leaves look green to our eyes). The violet color of "plant lights" copies exactly these light colors which chlorophyll absorbs rather than reflects. A leaf also contains supplementary pigments—for example, carotene. This pigment is yellow and also absorbs green light. This is why light color lamps approximating sunlight give better results.

During the last 15 years I have grown dozens of species of indoor bonsai under electric light. Under "plant light" I had to move a bonsai within four months to the greenhouse for rejuvenation. But under one single 15W fluorescent lamp, Phillips "WARM DE LUXE" 14 hours a day, a *Ficus retusa* ssp. *crassifolia* has thrived for a minimum of five to six years without any problem.

If you have room for only one fluorescent lamp, use a "warm" light color. For two lamps, one "daylight" (or "normal white") and one "warm" is recommended. For three lamps, two "daylights" and one "warm", or one "normal white" and two "warm" lamps is recommended. Change fluorescent lamps every six months as after this time their power diminishes.

Spot Light

Because of their size, fluorescent lamps are only good for an oblong site such as a sideboard or niche.

To illuminate a single indoor bonsai placed on a desk, for example, a spotlight is more beautiful. Here a mercury arc-lamp is recommended. Select those sold

especially for plants. The light of these lamps is very bright (1000 - 2000 Lux minimum), but sorry to say, all these lamps emit a slightly violet light and after some months the leaves of a tree, even when accustomed to dim light like *Ficus schlechteri*, will change to a pale grayish green, first sign that the light is not sufficient.

If an electric lamp is not bright enough, the leaves will eventually turn yellow and new branches will make long internodes. My advice is not to grow any plant under electric light of any violet color for longer than six months. Select another plant for this site and let the first one regenerate at a site with clear daylight.

How Long Light Has To Be On

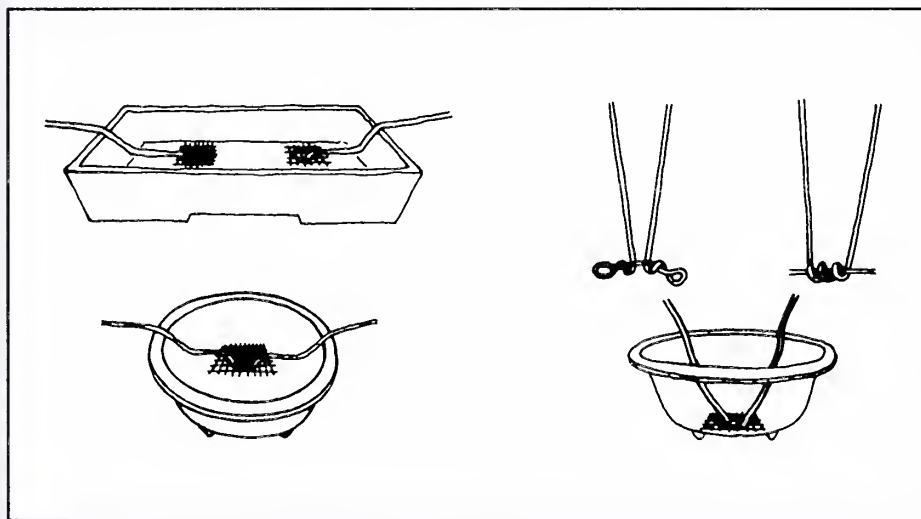
A tropical day lasts 12 hours. So tropical

plants are accustomed to having light for this amount of time. If the power of your lamp is not sufficient, turn it on for 14 hours a day but no longer as plants need a night as well. A timer will help for regular phases.

Additional Light for a Window with Dim Light

A northern window or one shaded by trees or a neighbor's house will not offer sufficient light for bonsai needing brilliant light. An additional lamp hanging overhead may help. On shorter winter days artificial light may prolong the plant's day time and the additional light from the top will encourage the leaves to turn not to the light outside, but rather to the light above, a very natural position. 🌱

SECURING BONSAI IN A POT



If the pot has only one drainage hole, twist wire like a candy wrapper or wrap it around a finishing nail so it will straddle the hole and be anchored to the underside of the pot.

DESIRABLE QUALITIES OF INDOOR BONSAI

SIGMUND I. DREILINGER

Many different species of trees, shrubs and vines can be trained as indoor bonsai. There are five qualities that are important:

- ❶ The ability to grow under reduced light.
- ❷ Lack of the need for a cool or dormant period. The above factors suggest understory trees—subtropical and tropical species.

The other three qualities of slightly less importance are:

- ❸ Attractive bark—such as *Malpighia*, Cork Bark Chinese elms.
- ❹ Flowers and fruit—such as *Carissa*, *Serissa*, *Malpighia*, pomegranate.
- ❺ Small or reducible leaf size—such as Chinese elm, Kingsville box, sea grape.

Temperate zone bonsai can be grown indoors successfully, but only when a

SIGMUND I. DREILINGER, *President and founding member of the Bonsai Society of Greater New York, editor of The Bonsai Bulletin, past president of Bonsai Clubs International, author and teacher, student to bonsai masters, is Guest Editor of this Handbook.*

chilling or dormant period can be supplied. I have succeeded in growing *J. chinensis* var. *sargentii*, *J. squamata* 'Prostrata' and *J. procumbens* 'Nana' indoors. This was done by keeping a window open, so that the temperature was lowered to 45 or 50 degrees F at night. Daytime temperatures remained at 70 to 75 degrees F.

Small Flowers & Fruit

Since these do not reduce in size readily, if at all, it is best to work with trees that have small fruit and small flowers.

Many trees are photoperiodic. Flowering is affected by the length of the day or night. Greater or lesser fruiting can sometimes be enhanced by the use of hormones or chemicals such as "Tomato Set."

Small Leaf Size

Small leaf size is more in proportion with the size of the bonsai. Defoliation can further reduce leaf size. Sea grape leaves have been reduced from seven or eight inches to one inch by this method. 🌿

NOTE: THE LIST OF TREES IN THIS HANDBOOK WILL INDICATE WHICH ONES CAN ADAPT MOST EASILY TO INDOOR CONDITIONS.



Pomegranate, part of the Naka collection, has small leaves and interesting trunk, flowers and fruit—all desirable bonsai qualities.

PHOTO BY SIGMUND DREILINGER

FERTILIZERS

SIGMUND I. DREILINGER

Many bonsai growers no longer use soil as a planting medium, but rather a soilless mix. This necessitates regular use of fertilizers, either organic or inorganic.

THE ADVANTAGES OF INORGANIC FERTILIZERS:

- ① They are water-soluble and readily absorbed by the roots.
- ② Use of different products will usually supply some trace elements in the impurities that are present in all chemical fertilizers.
- ③ Trace elements can be added as needed.

THE DISADVANTAGES OF INORGANIC FERTILIZERS:

- ① If used in too great a strength they will burn (injure) the root system.
- ② Daily watering will rapidly leach these soluble salts out of the planting media.

THE ADVANTAGES OF ORGANIC FERTILIZERS:

- ① There is a slow, small, steady release of fertilizer elements with each watering.
- ② No danger of burning the roots.
- ③ There are small amounts of trace elements in organic material.
- ④ They are long lasting.

THE DISADVANTAGES OF ORGANIC FERTILIZERS:

- ① They have an offensive odor as they decompose.
- ② They attract insects.
- ③ They burn the moss.

If you use inorganic fertilizers, vary the manufacturer. Use coated or slow-release types. Use regular chemical fertilizers at less than the recommended strength. When bonsai are in active growth feed every two

to three weeks. Reduce the frequency when growth slows; once every six to eight weeks is often enough. To reduce the danger of salt buildup, every four to five weeks water for one week with plain water.

Chemical fertilizers usually have a neutral pH of about 7.0. Acid fertilizers have a pH of 6.0 to 6.5. Read the labels of the package to make certain which fertilizers to use with which bonsai.

Nitrogen, phosphorus and potash percentages of each package are expressed in numbers such as 5-10-5. There are many different mixes available for different purposes. For more growth use a fertilizer with more nitrogen such as 10-6-4. For flowers and fruiting more phosphorus is better, such as 10-30-20.

After transplanting or root pruning do not fertilize for three to four weeks. There are vitamin solutions that are specifically made for use in reestablishing bonsai. One such is Transplantone. Others contain Vitamins B-1. Another chemical fertilizer is BR 76, with a 9-59-8 composition. It is good for blooming and fruit growth and root growth, but use it at one-half strength.

The pH of your water may cause chemicals to become locked up and unavailable. For most bonsai, a pH of 6.5-7.0 is best. For acid-loving bonsai, such as azaleas, 6.0-6.5 is needed. Inexpensive pH meters are available, or pH papers, or pH test kits. Pool supply centers are a good source for these materials. You can also phone your city water supply source and ask about your pH. In South Florida, Texas and other areas, the water is so alkaline it may reach pH 8.0-8.5. ☐

PLANTING MEDIA

SIGMUND I. DREILINGER

The needs of the commercial nurseryman have led to many changes in planting mixes in the last thirty years.

Soil, with its many insects and diseases, requires sterilizing treatment and some fertilization. To alleviate such time-consuming problems, soilless mixes were developed. Today—if it's used at all—sterilized soil is a mere 10 to 15 percent of the total composition of planting mixes. Other components include:

PEAT MOSS: slightly acid and retains water.

COARSE BUILDERS SAND: hard, neutral, does not absorb water, holds water on surface.

PERLITE: heat-treated mica-type rock, (usually in flakes), lightens mix, neutral, absorbs water.

VERMICULITE: heat-treated, mica-type rock, usually in flakes. Over time it tends to compact.

TURFACE, TERRAGREEN, HAYDITE AND OTHER FIRED CLAY PARTICLES: neutral, porous, absorb water, do not break down.

CHICKEN GRIT, TURKEY GRIT: basically coarse sand, hard, does not break down: sometimes contains other matter such as ground shell.

DECOMPOSED GRANITE: used a great deal in California; hand sieve to get rid of small particles; hard.

PINE BARK: use small size; porous, holds water, breaks down and decomposes within a year. Do not use more than 10 to 15 percent.

FIR BARK: use small size; does not hold as much water as pine bark; will last longer than pine bark before decomposing.

CHATTACHOOCHIE: small gravel or pebbles of over 1/8" to 3/16" diameter, hard, non-porous, used a great deal in Florida.

CRUSHED LAVA ROCK: neutral, porous, absorbs water; sieve to get rid of fine dust.

There are as many variations of planting mixes as there are bonsai growers. The most important factor is not water retention but airiness and ease of water penetration and drainage. Fertility is not a factor in any mix as it is controlled by frequency of use and variation in the components of the commercial fertilizers used by the bonsai grower.

Experimentation will determine which is the best mix for your bonsai. I use 1 part chattachoochie, 1 part Texas grit, 1 part crushed lava rock, 1 part pine bark (or fir bark). For acid-loving trees add 2 parts peat moss. When bonsai are in active growth I fertilize at half strength once a week for three consecutive weeks. The fourth week I use water with no additives to prevent salt buildup.

W A T E R I N G

SIGMUND I. DREILINGER

Japanese bonsai masters claim that it takes three to four years to learn the intricacies of watering.

Apprentices to the masters begin as "gophers." They are occupied with fetching, carrying and janitorial duties. It is in the second year that they first really commence to learn the how and when of watering.

In the United States there isn't an apprentice system but a teacher/pupil relationship. Without the daily interaction as provided by the Japanese apprentice system, there is an incorrect tendency among Americans to discuss watering as a matter determined by the clock.

But frequency of watering bonsai should take into account many factors. Some of these are:


- ❶ **HUMIDITY.** Centrally heated or air conditioned homes will sometimes have the relative humidity of a desert. Locating the container on a tray of gravel partially filled with water, or misting the bonsai 4-5 times a day, or the use of a vaporizer, will increase the humidity. Bonsai media have the tendency to dry out rapidly and will require more attention.
- ❷ **TEMPERATURE.** Higher temperatures will cause the bonsai to use up the available water supply and require replenishment.
- ❸ **PLANTING MEDIA.** Media that contain a greater percentage of larger particles of hard non-porous material such as

chattahoochie, gravel or decomposed granite will retain less water. This increases the frequency of watering.

- ❹ **FOLIAGE MASS.** Other factors being equal, bonsai that have a greater foliage mass will transpire more, dry out sooner and require more water.
- ❺ **SIZE AND GLAZE OF CONTAINERS.** Small containers hold less media and consequently need watering more frequently. Containers that are glazed will dry out more slowly and will need less watering.
- ❻ **GROWTH AND DORMANCY.** Bonsai require more water during their growth period; when dormant, water less.

To some extent all these factors affect bonsai water requirements. This is why watering can vary from twice daily to as infrequently as every second day.

The easiest way to keep track of the condition of your bonsai medium is to insert your finger into it and feel whether your medium is damp. Lifting the container with your bonsai in it will also determine whether it needs watering. When dry, it will be lighter than when wet. An inexpensive water meter may be purchased from a nursery and I find its use an accurate way to determine the condition of the planting medium.

To create a beautiful bonsai, nothing takes the place of close and careful observation on a daily basis. 



Serissa foetida in flower.

PHOTO BY ELVIN McDONALD

PESTS & PROBLEMS

SIGMUND I. DREILINGER

Before adding a new plant to your bonsai collection, keep it in quarantine for two to three weeks and examine it daily for pests.

If you summer your bonsai outdoors, combine acclimatization with preventive

treatment. Place your bonsai in a shaded place for two weeks before bringing indoors. Check them very carefully for pests, especially the axils, undersides of the leaves, and the crotches of the branches.

The use of the correct insecticide is

HOUSEPLANT PROBLEMS

DAPHNE S. DRURY

LEAVES WILTED	Too much or too little water. Too small or too large a pot.
LEAVES DROPPING OFF	Too much water.
BOTTOM LEAVES ARE YELLOW	A few are to be expected. If there are many, the plant may be potbound or may be going into a resting period.
LEAVES ARE PALE GREEN OR YELLOWISH.....	Too little or too much light. Lack of fertilizer, particularly nitrogen.
PLANT THIN AND ETIOLATED	Too little light.
GROWTH STUNTED	No drainage hole. Too heavy a soil mixture.
LEAVES HAVE DRY TIPS	Humidity too low or soil too wet.
LEAVES ROLLING UP.....	Drafts, especially from an air-conditioner or ill-fitting windows.
YELLOW OR BROWN SPOTS ON LEAVES.....	Caused by sun burning the leaves.
SUCCESSIVE LEAVES GROWING SMALLER	Potbound or insufficient fertilizer.
PLANT ROTTING AT NECK OR CROWN.....	Too much water. Badly drained soil. Too cold.
ALL LEAVES DROP OFF SUDDENLY	Cold air. Gas injury. Lack of water.

P E S T S

NAMES APHID	SIZE 1/16"-1/8"	COLORS Red, green, pink, brawn	STAGES Egg 3-8 nymph stages Adult	PESTICIDES* Darmant ails Metasystax Malathian Pyrethrum	COMMENT 2-3 applications 3-5 days apart
SPIDER MITE	1/32" or smaller	Red, Brawn, Black	Egg Larva Chrysalis Feeding stage Chrysalis adult	Darmant Oils Kelthane Metasystax Orthene	3 Applications 7 days apart. Difficult to see. Put paper under branches & tap the branches. Look for moving specks.
SCALE	1/16"-1/8" Oval or round bump	Brawn, black gray, white	Egg Nymph Crawler Adult	Darmant Oils Malathian Orthene Metasystax	Crawler stage – easiest to control. Spray 3 times 7 days apart. Touch adult scales with Q-tip dipped in alcohol.
MEALY BUG	1/16"-1/8"	White cotton- like fluffs	Egg Adult	Malathian Orthene	Easily controlled. Spray twice 1 week apart. Check under leaves, axils or branch cratches.
WHITE FLY	1/16"-1/8"	White	Egg Crawler Feeding stage Winged adult	Resmethrin Orthene Malathian	Spray 3 or 4 times at 5 day intervals, more if needed. Yellow sticky baards will catch adults.

* Use pesticides only as a last resort. Try hand-picking and insecticidal soaps first.

imperative if pests are present. Check to ascertain that those used are not harmful to your bonsai. Read the labels carefully, and use only at the proper dilution.

When you move your bonsai indoors, examine them daily. If there is a pest problem, try Pyrethrum or Resmethrin or some of the Safer agricultural soaps. These are relatively harmless to humans. The use of contact or systemic poisons

indoors is potentially harmful. If you must use them, spray in the garage or outdoors at midday if the temperature is above 40 degrees F. Use gloves and a face mask and wash off thoroughly and immediately (including your clothes). Systemics can be absorbed through the skin.

Do not use Malathion on *Ficus*, *Crassula*, *Podocarpus* or buttonwood. Do not use Dimethoate on *Ficus* or *Podocarpus*.

EVEN BONSAI GROWERS NEED A VACATION

EDMOND O. MOULIN

Because bonsai are grown in small containers, they require more frequent watering than many houseplants do, and the grower must be ever alert to their needs. But what happens when you want a vacation? Try the "bonsai-sitter bag." It's also an aid for acclimating plants newly purchased from a greenhouse or to nurse recently root-pruned bonsai through a critical period. Here's how it works:

Use a clear plastic bag large enough to envelop the plant and container. Care

is essentially the same as for a terrarium. Water the soil well and let it drain thoroughly before placing container in the bag. Inflate the bag to create a bubble or form wire into hoops and insert the ends into the container to make a support frame for the plastic so that the foliage does not touch the plastic.

Place the enveloped plant where it gets good light but no direct sun rays.

The bag may have to be opened occasionally to allow excess moisture to evaporate. This works well for about two weeks without adding water. Open the bag gradually over several days to acclimate the plant to drier surroundings. 🌱

EDMOND O. MOULIN, *Director of Horticulture at the Brooklyn Botanic Garden, has written articles and lectured on bonsai.*



Serissa foetida variegata.

PHOTO BY CHRISTINE M. DOUGLAS

GROWING FROM SEED & CUTTINGS

KATH WILLIAMS

A great deal of pleasure in growing bonsai indoors comes from the opportunities it provides to grow the more exotic plants. Here in Great Britain, as in many other parts of the world, bonsai enthusiasts have a wide selection now available to them from tropical, subtropical and other climates where bonsai originate.

Seeds

The pleasure that can be obtained from growing from seed enhances the benefits of growing indoor bonsai. A real advantage in growing subtropical plants from seed is that they germinate more readily and grow more quickly than our native, hardy specimens. The result is that you can have an attractive little bonsai quickly.

In stock at our local supermarket is a considerable variety of tropical and subtropical fruit. Some which are very straightforward to germinate and similar

in character are the citrus fruits: orange, lemon, lime and grapefruit. They make very pleasant evergreen trees with dark shiny leaves. They germinate easily and show a rapid rate of growth to begin with, but do not be surprised if they slow down after their initial spurt. They soon get going again and proceed to grow slowly and steadily.

Another easy seed to germinate is the pomegranate. If you buy one fruit and plant a third of the seeds, you will still have more trees than you can cope with. Be careful not to overwater the young seedlings or they will rot and collapse.

The more unusual fruits one can try are fresh olives, mangoes, dates, figs and litchis. All of these will germinate provided you wash the seed and allow them to dry for a few days in a well-ventilated area. Soak them overnight before planting in a good seed compost, then set in a warm place. Use either a propagating tray, or failing that, the airing cupboard —this is ideal as long as you watch for the first shoots to appear, then place them in a light

KATH WILLIAMS, a bonsai enthusiast living in Great Britain, has written many articles for bonsai society journals and is a lecturer and teacher as well.

area. If left too long in a dark cupboard, etiolation results, producing the inevitable long, leggy seedling of little strength or attraction.

Once they've germinated, plant in individual pots in a well-drained mix comprising of 50% peat, 25% loam and 25% grit. With a fair measure of persistence and some luck, your seedlings should soon be reaching the stage when you may start training them. Pinch out and wire exactly as you would outdoor trees. Remember, however, that many of these indoor bonsai are evergreen and do not have a surge of sap in the growing season. Unlike native deciduous trees that become less brittle when sap flows, many indoor specimens remain brittle all year. They snap off very easily—therefore try to wire branches while they are still green and pliable.

Cuttings

One can start bonsai from cuttings or even retrain houseplants. Taking indoor bonsai cuttings is a year-round exercise as they grow year-round.

For those plants that take a rest period, wait until the new growth commences before taking cuttings. If your house is centrally heated to a temperature of 70° F. or more, and you maintain a good level of humidity around your indoor specimens, this may be your trees' "warmest" season.

Take cuttings of new wood about four inches in length, dip into hormone powder, place in either perlite or sand (not too fine), moisten, cover with a plastic bag and place in a constantly warm temperature. Roots on most varieties should appear in four to six weeks.

Varieties from which cuttings can readily be taken include *Ficus* (weeping fig), *Crassula* (jade tree), *Schefflera* (umbrella plant) and *Dracaena*. Once rooted, treat like any other young stock.

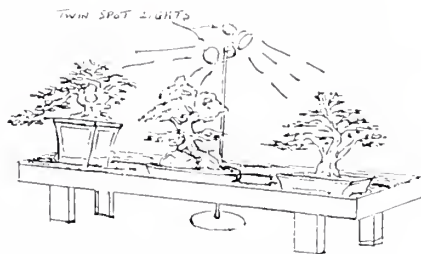


Fig 1

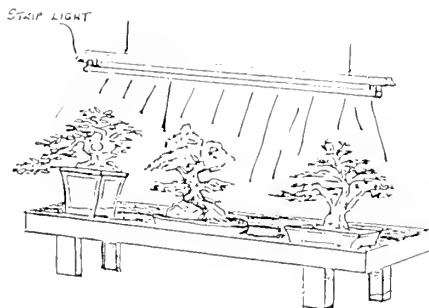


Fig 2

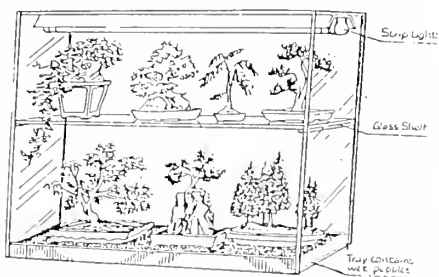


Fig 2



RESTING PERIODS, LIGHT EFFECTS AND INDOOR BONSAI

STEPHEN K-M. TIM

The days shorten and the air becomes tinged with a perceptible chill. Autumn has arrived. Our thoughts turn to the change in season in the garden and the protection of the plants over the winter months ahead.

Where indoor bonsai are concerned, the pros and cons of providing a resting

period are not at all clear. In discussions with Edmond Moulin, Director of Horticulture at the Brooklyn Botanic Garden, who has taught bonsai over many years, he has expressed some concern over the confusion between the terms *dormancy* and *resting period*. Some bonsai growers use the terms interchangeably. Mr. Moulin and I consider them distinct and will attempt to differentiate between the two.

STEPHEN K-M. TIM is Vice President of Science and Publications at Brooklyn Botanic Garden.



Azaleas need a rest period of four to six weeks.

PHOTO BY ELVIN McDONALD

Resting or Dormant?

Hardy bonsai, including the beeches, maples, junipers, firs, spruces and pines are, in nature, prevented from growing during the freezing to near-freezing winters. They undergo full dormancy and in this way survive the vicissitudes of this frigid season. Non-hardy bonsai, those being discussed here for indoor growing, are drawn from a great diversity of habitats, from the subtropics to the temperate regions of the world. Ones from the latter region enjoy cool but mostly frost-free winters with temperatures dropping to a minimum of 40° to 45° F (4° to 10° C). Providing a period of lower but above freezing temperatures over winter will be called a resting period in contrast to a dormant period where freezing or near-freezing temperatures are implied.

The need to fulfill the dormancy requirements of hardy bonsai is well recognized; without a period of exposure to cold, usually near freezing, these may defoliate, show shoot die-back and decline in general health. Providing a resting period for indoor bonsai has been less strongly advocated. This is most likely due to their responding less dramatically when a regimen of a resting period is not strictly observed. The exception is with plants that respond to a resting period by rewarding us with a dramatic spring flowering. In the case of Kurume azaleas, *Rhododendron obtusum*, a resting period of four weeks at 40° F (4° C) is necessary to assure a flush of flowers in spring, and the common olive, *Olea europaea*, fails to produce flower buds if denied a cool spell the previous autumn or early winter.

Even for plants native to the warm tropics, a uniform rate of growth throughout the average year seems not the rule. They appear to have a built-in or endogenous growth rhythm that, while not necessarily related to environmental

necessity, appears beneficial to the plant if adhered to. The same applies to indoor bonsai. Mr. Moulin and I side with providing a rest period for all such bonsai, particularly ones from a warm temperate habitat. We may be hard-pressed to define the precise benefits to the plant but we feel the trees will respond by living healthier and longer lives.

Light Effects on Resting Periods

Light plays a part in the initiation of dormancy. In autumn, the shortening days trigger a reaction among temperate plants, causing growth to slow down and the leaves, in deciduous plants, to fall. This is all part of the process of acclimation, when hardiness becomes established enabling plants to survive the winter. In as much as dormancy may assure the plant's sustained vigor the following year, the length of day (length of the light period) to which a plant is exposed may influence its flowering. This is the Photoperiodic Effect.

Plants are classified as long- or short-day types, requiring more or less than 13 or 14 hours of light per 24 hours. By the correct priming of plants as their flower buds are being formed, their optimum in flowering is assured the following year. Day-neutral plants are independent of the length of day. Among these are the pomegranate and *Serissa* that appear to bloom irrespective of the length of the day/night cycle. Day length also influences autumn leaf coloration. Especially where red pigments are concerned, as in some maples, shortening days in late summer and early autumn, combined with bright days and cool nights, are necessary to bring out the most vivid of autumn leaf tints.

Preparing Plants for the Resting Period

When outside temperatures begin to dip

toward the 55° to 60° F (13° to 15° C) mark in the autumn, indoor bonsai need to be prepared for winter. If the plants have spent the summer outdoors and are to be brought indoors to a frost-free spot, the period of transition or preparation is a vital time. Avoid suddenly transferring them indoors. As summer comes to an end, move the plants to a shadier part of the garden for about two weeks. This primes them for living in lower light. Then bring them indoors at least two weeks before the heating system is to be turned on, enabling them to acclimate to the change in growing conditions. This slow transition is less important when the move is into a temperature and humidity controlled greenhouse but the growing conditions in the average home are extremely dry. The desiccating effect of the desertlike atmosphere is decidedly stressful on the plants, particularly if they are not adequately prepared for the change. The standard method of increasing the humidity around the immediate vicinity of the plants is to stand them on top of pebbles in a water-filled tray. This helps but a cool vapor humidifier is the only efficient way to raise the humidity indoors.

Plants and Their Requirements

Because of the wide range of habitats from which the more popular indoor bonsai are drawn, it is impossible to standardize their winter requirements. The grower is urged to use good sense in determining the conditions most suited to the particular plants being grown. The following is an attempt to aid in the process. Four categories are distinguished by their requirements for a resting period. The species have been drawn from the selection of plants most commonly grown indoors as bonsai. Other plants not listed should be matched with the appropriate categories.

CATEGORY I: Tropical Plants

Includes:

<i>Brassaia actinophylla</i> :	Australian umbrella tree
<i>Conocarpus erectus</i> :	Buttonbush
<i>Dizygotheca elegantissima</i> :	False aralia
<i>Ficus benjamina</i> :	Benjamin fig
<i>Polyscias fruticosa</i> :	Ming aralia

Plants in this category are least dependent upon a defined rest period. Plant growth seems sustained at an even level throughout the year. Providing a resting period is optional but, as with all plants, at least a drop of about 10° F (12° C) at night is of benefit to the plants.

CATEGORY II: Warm- to Mild-Temperate Plants

Includes:

<i>Carissa grandiflora</i> :	Natal plum
<i>Crassula argentea</i> :	Jade plant
<i>Cuphea hyssopifolia</i> :	False heather
<i>Cycas revoluta</i> :	Sago palm
<i>Fortunella hindsii</i> :	Hong Kong wild kumquat
<i>Leptospermum scoparium</i> :	Tea tree
<i>Malpighia glabra</i> :	Barbados cherry
<i>Myrtus communis</i> :	Common myrtle
<i>Olea europaea</i> :	Common olive
<i>Podocarpus macrophylla</i> :	Japanese yew
<i>Punica granatum</i> :	Pomegranate
<i>Serissa foetida</i> :	Serissa
<i>Syzygium paniculatum</i> :	Brush cherry

In their native habitats, these plants enjoy cool winters that are free from frost. A rest period of six to eight weeks with night temperatures of 50° to 55° F (10° to 13° C) and day temperatures no more than 10° F (12° C) higher during winter is optimal. In the confines of an apartment, finding a place with such a

sustained temperature may be difficult. Check on temperatures near the floor below a window or move the plants to an unheated room. At the temperatures advocated, very little new growth will be made by these plants and they will need much less light than normal. But avoid direct, unfiltered sunlight as the sudden warmth may force plants into growth, making them vulnerable to subsequent drops in temperature. Keep plants moist but do not overwater. Occasionally mist the trunk and branches.

CATEGORY III:

Mild-Temperate to Temperate Plants

Includes:

<i>Buxus microphylla</i> :	Boxwood
<i>Camellia sasanqua</i> :	Sasanqua camellia
<i>Chamaecyparis pisifera</i> :	Sawara false cypress
<i>Cupressus arizonica</i>	Arizona cypress
<i>Cupressus macrocarpa</i> :	Monterey cypress
<i>Ficus neriifolia</i> :	Willow-leaved fig
<i>Hedera helix</i> :	English ivy
<i>Ilex crenata</i> :	Japanese holly
<i>Ilex vomitoria</i> :	Yaupon
<i>Lagerstroemia indica</i> :	Crape myrtle
<i>Pinus halepensis</i> :	Aleppo pine
<i>Rhododendron indicum</i> :	Indica and Satsuki azaleas
<i>Rhododendron obtusum</i> :	Kurume azalea
<i>Sequoia sempervirens</i> :	California redwood
<i>Taxodium distichum</i> :	Bald cypress

These plants are accustomed to lower temperatures than those in Category II and should be held at 40° to 45° F (4° to 7° C) for at least six to eight weeks. Growth will have almost ceased at these temperatures but leafy plants will be better kept where they receive filtered light

to prevent leaf yellowing or leaf drop. Direct sunlight must be avoided. A garage, basement, unheated greenhouse or well-insulated cold frame will provide correct conditions. To insure that temperatures at the root ball remain even, pots may be covered with a mulch of sawdust, leaves, bark or coarse peat.

CATEGORY IV:

Temperate to Cool-Temperate Plants

Includes:

<i>Juniperus procumbens</i> 'Nana':	Juniper
<i>Juniperus squamata</i> 'Prostrata' :	Juniper
<i>Pinus thunbergiana</i> :	Japanese black pine
<i>Ulmus parvifolia</i> :	Calin elm

While these plants can be treated as for Category III, they have been separated out because they can tolerate freezing temperatures during dormancy provided they are well protected. However, they are not ideal for indoor culture, especially for the inexperienced. Enthusiasts are too often tempted to try these plants because their form and compact leaf growth give the appearance of an "instant" dwarfed tree.

For bonsai growers intent on trying plants that are closer to being hardy bonsai rather than indoor types, and who do not have access to cool garages, basements or cold frames, the standard advice has been to overwinter them in a box on the fire escape of the average apartment building. If this is done, the pots must be mulched over and the open end of the box made to face the wall. This prevents desiccating winds from drying out the top growth and lessens the chances of cycles of freezing and thawing that are fatal to the plants. However, I should caution that the practice of placing any object on a fire escape is most likely illegal.



Chamaecyparis pisifera 'Squarrosa' needs a cool period to grow successfully.

PHOTO BY ELVIN McDONALD

An alternative to the above is to refrigerate the plants for the required dormant period by housing them in that part of the refrigerator that holds a temperature of 40° to 45° F (4° to 7° C). Since the atmosphere here is dry, the plants should be placed in large inflated plastic bags on a layer of damp peat to provide moisture around the plants.

A word of caution here where Catego-

ry IV-type plants have been subjected to full dormancy. Plants are better kept on the cooler side for an extended period of time, the reason being that if they are exposed to warm room conditions after their dormancy requirements have been met, the new growth that would result might coincide with the inadequate light intensity of January and/or February and etiolated growth may be produced. 🌱

GUIDE TO CERAMIC BONSAI CONTAINERS

PHIL TACKTILL

Bonsai containers are a subject seldom touched upon by authors of bonsai books. Because the selection of a container is so important in terms of both aesthetics and cost, we should have some understanding of the vast variety of containers—their styles, colors, shapes and prices. The following illustrations and charts should be helpful references for selecting a container that is appropriate for the bonsai and for judging its quality and value.

First, some general information that is usually true:

- Japanese ceramic containers are fired at 2000° F—a higher temperature than used in other countries.
- Poured containers are the least expensive.
- Press-molded containers are medium to high priced.
- Thrown containers are medium to high priced.
- Hand-formed containers are in the high price range.
- Antique containers are the most expensive and most difficult to identify.
- Each additional operation in manufacture will add to cost.

Illustration of Containers

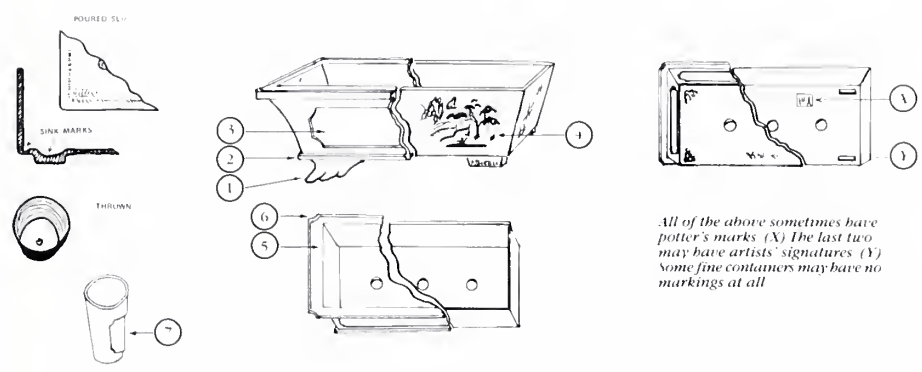
If you note the illustrations, it becomes obvious that each addition to the basic form of a container adds to the cost. The finer the detail, the more the cost. Chart A shows three views: side, top, bottom. The right side is the simplest, and the left side is the more ornate. The additional details added to the basic containers illustrated are as follows: #1 a cloud leg, #2 a bottom rim, #3 a window panel recess, #4 drawings and designs on the body (a right side drawing is shown), #5 an upper lip, #6 a notch in the corner of container with a rim. Add a glaze and you have just run the price of a simple container way up.

Some of these details can be molded in a poured container but are usually not in sharp detail. Number 7 shows construction of a container design that can be poured or press-molded. Its design is such that it can easily be withdrawn from the mold. Note the top of the design indents and the bottom protrudes so it can be slid from the mold.

Irregular forms, if used properly,

CHARACTERISTICS OF CONTAINERS

Chart A



All of the above sometimes have potter's marks (X). The last two may have artists' signatures (Y). Some fine containers may have no markings at all.

DISTINGUISHING FEATURES

TYPE OF CONTAINER	SINK MARKS	ANY SHAPE	NORMALLY ROUND	THIN & LIGHT	THICK & HEAVY	GLAZED	UNGLAZED
poured slip mold	Yes	Yes		Yes		Yes	Yes
pressmold		Yes			Yes	Yes	Yes
thrown			Yes	Yes	Yes	Yes	Yes
hand formed	Yes	Yes		Yes	Yes	Yes	Yes

should be an asset, and in Japan they are prized possessions. They are what makes one container different from all that are produced. Much can be said for individuality of containers.

Matching Tree Style and Container Forms

Generally speaking, straight lines on a container go best with a straight (upright) tree or trees. Curved lines go

best with informal trees. Chart C shows suggested combinations of tree styles with container styles.

The black dot in the illustration on Chart C indicates the recommended placement of the tree in the container. A more ornate bonsai container requires a more powerful or dramatic tree. The container should harmonize and complement the tree. The color of the container is most important. With ever-

A collection of bonsai shows
the many types of containers
that can be used.

PHOTO BY ELVIN McDONALD



greens, red (terracotta), brown and green body colors are recommended, with fruiting and flowering bonsai and trees with bright fall colors, choose a container with a color that complements the most colorful phase of the tree. (See Chart **B**.)

When using bright colored contain-

ers, consider, for example, the effect of looking at a blue glazed container, 4" or 6" deep by 20" long. This long panel of color would require a tree that can contrast with such a large colored area. On the other hand, the area of a *shohin* bonsai container, 2" x 2", that is bright red would not be offensive, since the colored



area is so small.

Trees should be displayed at their time of maximum color.

There are many rules on how long and wide a container should be. I find one's eye to be a good judge and there is a wide latitude in selection. However, the depth of the container as it pertains to

the thickness at the base of the trunk is of major importance. The formula that I use is the depth of the container should be from $1/2$ to $2-1/2$ times the thickness of the base of the trunk.

An obvious exception would be the semicascade and cascade trees where the greater depth of the container is an

important counter-balance to the mass of foliage outside the container.

Some other points:

- If you display a square container with its point forward, you increase the length of the container.
- Vive la difference. I, like many, welcome a container that differs. What Americans refer to as an irregular container (a warped container for example) I look at as one-of-a-kind.

That makes my container unique.

- Containers should be stored outside and aged like the bonsai so that they will develop a patina and softened colors. ☼

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CHART B

Color of Container	Color of Fruit, Flower, & Foliage							
	White	Violet	Pink	Red	Yellow	Blue	Orange	Green
Red	●				●	●		●
Blue	●	●	●	●	●		●	
Green	●				●		●	
Yellow			●	●		●	●	●
Violet	●	●	●				●	
Brown					●		●	●
White	●		●	●	●	●	●	●
Orange						●		●
Black	●	●	●	●	●	●	●	●

HOW TO INCREASE HUMIDITY FOR SUBTROPICAL BONSAI

JOCHEN PFISTERER



Bonsai-terrarium made of glass plates. The small strip at the bottom in front makes a flat tray, that can be filled with gravel to increase air humidity. Plants: *Ficus benjamina* 'Starlight', *Ulmus parvifolia*.

Many subtropical and some tropical trees, grown as indoor bonsai, require high humidity because of their tender leaves, a result of thin cuticles. (This wax layer, when thick enough, protects leaves from drying out.)

These thin-cuticled trees are not easily grown in centrally heated apartments, especially those plants originating in subtropical coastal sites. Some examples are California cypress (*Cupressus macrocarpa*), plants from southern China and Japan such as *Ehretia microphylla*, *Sageretia thea*, *Serissa foetida* and *Ulmus parvifolia*. Shrubs from tropical rainforests—such as *Polyscias* species—are also unaccustomed to dry air.

With the exception of *Polyscias*, the plants cited require bright daylight dur-

ing wintertime, in a window facing the south or west. During summertime a window to the east or west is recommended, although the optimum in summer would be a partly shaded site in the open air. *Polyscias* prefers a not-too-bright light. Electric light or a place in a window facing north, east or west is good.

In wintertime, air in a centrally heated room is rather dry. This is because a cold gas is not able to contain the same high level of relative humidity as a warmer gas. In wintertime the air outdoors has a normal humidity of about 60% or more. When this frosty air is heated indoors up to 20° C, its relative humidity sinks remarkably.

In a dry atmosphere only plants with thick cuticles will survive without prob-



A "tokonoma" in my dining-room. It is illuminated with one fluorescent lamp of only 15 W, sufficient for tropical *Ficus* species.

lems: the tropical *Ficus* species; the plants from subtropical semideserts such as *Brachychiton*, *Portulacaria* or *Sarcocaulon*; and the sclerophyllous shrubs such as *Laurus*, *Olea* and *Myrtus* from Mediterranean regions.

Fortunately, there are some easy methods to increase humidity around semitropical bonsai...up to 60 to 80%:

① INCREASED WATERING

This allows the roots to transport more water to the leaves. Of course there is a certain risk. Roots in a wet soil, because of anaerobic conditions, can rot. They do not receive enough oxygen.

To avoid this problem, you should use a soil mixture able to maintain good ventilation even when wet:

1/4 GRAVEL, 1-6 mm diameter (1/25 - 1/6 in.) of lava, pumice or broken bricks. Do not use gravel containing lime. Fine gravel guarantees a better ventilation of the soil than does sand.

1/4 PEAT, (short fibers are acceptable)

1/4 COMPOST, sifted with a screen, mesh-size up to 1/3 - 1/2 in.

1/4 CLAY, in small grains

This soil mixture even allows permanent watering of a bonsai by wicks from a tray, filled with water.

② FLAT TRAY, FILLED WITH WATER OR WITH GRAVEL & WATER

To increase humidity by evaporation, you may use a flat tray out of some water-resistant material like plastic, stainless steel or earthenware. This tray should be two to three times larger than the bonsai pot. Make certain that the tray is not wider than the windowsill you

want to put it on!

Put the bonsai on a flat stone or some flat base so that the pot stands over the water surface — otherwise the roots may rot. Fill the tray with water regularly. As the water evaporates, the atmospheric humidity around the bonsai will be increased.

②a WATERING BY WICKS

To make regular watering unnecessary, you may use cotton wicks. A crochet hook is put through the soil and pot's hole from above. Catch the wick with the crochet hook and pass it through the soil, making sure that an end of 10 inches (minimum) rests under the bonsai pot. A large pot may have three to four wicks.

Put the bonsai pot on its base. Stick the wick tails among the gravel. The wicks will transport water constantly to the roots.

Caution: If your bonsai grows in a more solid soil there may not be enough oxygen at the roots. Do not water too much. If the tips of the leaves begin to dry out, this is the first sign that a plant has a soil too wet for its roots. If you are unaccustomed to noting very slight changes in your plants, it is best to first try this method on a not-too-precious tree.

③ BONSAI TERRARIUM

A method for extremely dry rooms or a windowsill with a radiator underneath.

Such a terrarium is constructed like a dollhouse, but the material is glass or polyacrylic sheets, bonded together with a silicone adhesive. You need six sheets for the back and two sidewalls, top and bottom; the sixth sheet is a very small strip in front at the bottom. Fill the bottom with gravel.

In such an enclosure—just the front is open—atmospheric humidity inside the

terrarium is rather high. The open front allows easy watering and manipulation of the bonsai and sufficient ventilation.

A terrarium like this can also be positioned within a room. Put an aquarium lamp at its top, leaving the light on for 12 to 14 hours a day. Its best to use a timer.

❹ **CLOSED VITRINE WITH HYGROMETER**

One method successfully used to grow orchids or bromeliads in a centrally heated room is to put the plants in a closed vitrine, or glassed display cabinet. It is also good for subtropical bonsai trees.

The closed atmosphere carries a certain risk: Because of a very high humidity

without any ventilation, parasitic fungi, especially *Botrytis*, may occur.

To prevent this problem, here are two suggestions: Control humidity regularly—best regulator is a hygrometer—and when humidity is higher than 80%, open the doors. Treat the trees monthly with a mild fungicide.

Finally, not all subtropical plants need the same high level of humidity. Fuchsia and pomegranate, for example, prefer less than 60%. When humidity is too high, small drops will occur at the leaves' tips. My advice: Decrease humidity with better ventilation until water-drops no longer occur on your plant's leaves.

EDITOR'S NOTE:

**Wilma Swain, living and working in Canada,
offers these additional thoughts on the subject of humidity for bonsai:**

- A small wall gauge to measure the humidity is helpful.
- Many homes have an automatic humidifier attached to their furnaces. A portable electric humidifier can be installed near the plant-growing area. If you have the space, a room could be made exclusively for your plants and kept at a lower temperature, automatically increasing the relative humidity.
- The texts examined on this topic omit the fact that sitting water in a tray will develop, over time, a slime or other growth—giving an unpleasant appearance and developing an odor. I recommend adding a fungicide or herbicide to the water of any tray used for evaporation.
- It's advantageous to bunch plants together as this helps to increase the surrounding humidity through their own transpiration.



Land and water penjing using crown-of-thorns (*Euphorbia wiliii*).

LAND AND WATER PENJING USING INDOOR PLANTS

HAL MAHONEY

We are very familiar with the meaning of the Japanese word, bonsai. We are less familiar, however, with the Chinese word, penjing. *Pen* means tray and *jing* means scene. The word penjing, therefore, refers to a tray scene or a tray

HAROLD E. MAHONEY, *President of the Bonsai Society of Greater New York, President of the Long Island Bonsai Society and 3rd Vice-President of Bonsai Clubs International, writes, teaches, lectures and demonstrates bonsai.*

landscape. The landscape may possess trees, soil, water, rocks, accessory plants, moss and even small figurines.

There are numerous tropical treelike plants that may be used for indoor penjing. A partial list includes the following: *Malpighia coccigera*, *Serissa foetida*, *Ficus benjamina*, *F. nerifolia regularis*, *Olea europaea*, *Syzygium paniculatum*, *Ulmus parvifolia* 'Catlin', *Buxus microphylla* 'Compacta', *Myrtus communis*, *Coloneaster* (varieties), *Cryptomeria*, *Azaleas* (varieties),

Portulacaria afra.

In this article I'll be describing how to construct a land and water penjing.

There are basically three kinds of land and water penjing. One type involves the placement of land on one side of a tray and water on the other.

In such a case, the division of land to water should be uneven to create interest. (Fig. 1)

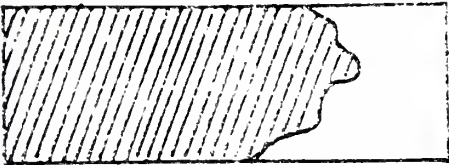


Fig. 1

A second kind of land and water penjing involves land on either side of a stream. In this case, the stream should be located well to one side and not in the middle of the tray. (Fig. 2)



Fig. 2

The third kind of land and water penjing is an island of land surrounded by water. The island should possess an uneven coastline and should be located well to one side of the tray, not in the center. (Fig. 3)

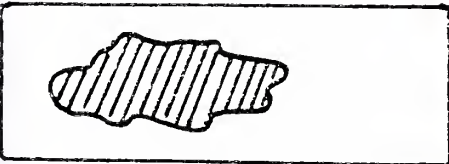


Fig. 3



Fig. 4: mature crown-of-thorns.



Fig. 5: cuttings taken from above.



Fig. 6: planted cuttings.

The unevenness built into all three types of penjing helps to add to the interest of the finished product.

Penjing are usually constructed with outdoor plants but can also be created with indoor plants. An excellent and unusual plant that can effectively be used for penjing is *Euphorbia milii*, dwarf crown-of-thorns. The plants are very easy to propagate, their leaves are small, they are easy to care for, they are virtually disease free, they possess interesting thorns, and their beautiful red flowers are present the entire year.

In order to create a large and interesting penjing, it is necessary to obtain many plants of varying sizes. This is easily accomplished by obtaining two or three older plants from which large numbers of cuttings can be made. A good rooting medium for the crown of thorn cuttings consists of 75% coarse builder's sand and 25% sphagnum peat moss. The cuttings should be of varying sizes. Some should be very small—one to two inches; others—up to six or eight inches. A sufficient number of cuttings can be obtained from just one or two mature plants. (Figs. 4, 5, 6)

The cuttings root easily, so it is not necessary to use rooting hormone. If the cuttings are raised in bright sunlight or under bright artificial lights, they will branch rapidly and will begin to produce their beautiful flowers almost immediately. The cuttings should be ready to use in just one or two growing seasons. With a little luck, you may find all the plants you need at a local nursery.

In planning penjing, proceed basically as you would with an ordinary forest planting. The plan described here would be for a land and water penjing possessing a stream with land on either side.

First, construct a stream bed to one side of the tray, away from the edge. Rocks may be used to outline the stream

bed, use the same type to provide necessary harmony but of unequal sizes to create variation. Curve the stream bed so that its source cannot be seen. (Fig. 7)

Place the rocks on wax paper and

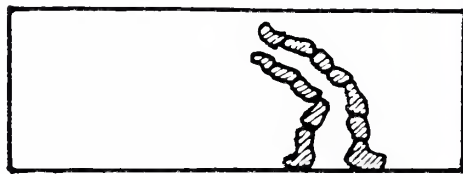


Fig. 7

cement in place with a waterproof, quick drying, hydraulic cement such as Thoro's Waterplug. This procedure will allow arrangement of the trees to proceed without displacing the rocks. The wax paper prevents the rock from sticking to the tray and can be removed after the cement dries. Create a curved irregular stream bed to increase interest.

The stream bed should be placed approximately one-third from one side of the tray. The crown-of-thorns "trees" should then be placed so as to create a large, uneven triangle to the left of the stream bed and a smaller triangle to the right of the stream bed. Place the largest tree one-third from one side and slightly to the rear of the tray. The second and third largest trees are then placed to form a scalene triangle when viewed from above. (Fig. 8)

With the three major trees in place, proceed to construct the large triangle around trees 1 and 2, and the smaller triangle around tree 3. (Fig. 9)

Use trees of the same variety to enhance the harmony in the planting. However, use trees of different heights and different trunk diameters. Plant at varying heights above the tray with the tallest trees on the highest hummocks and spaced unevenly. Plant the largest

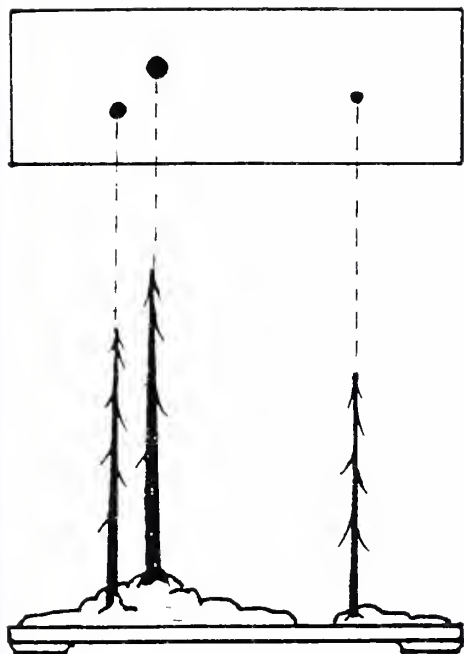


Fig. 8

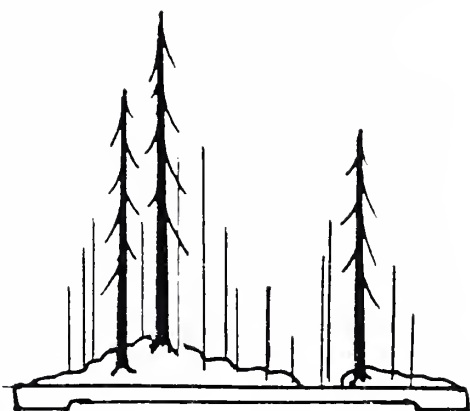


Fig. 9

trees to the front and smaller ones to the rear to create perspective. The surface topography of the soil should be very uneven and covered with moss to hold the soil in place and give the penjing a well established look (Fig. 9). If the moss is collected from an area of light shade, it will stay green all winter long under strong fluorescent lights. Additional rocks may be placed at varying intervals singly, and in small groups to create further interest.

While any oval or rectangular tray may be used, a white Chinese tray, 23 inches in length, was used in this construction. The tray is unique in itself and serves as a beautiful frame for the green plants, red flowers, moss and rocks.



Texas ebony.

TEXAS EBONY

EDITH SORGE

I have grown many bonsai suitable for growing indoors but my loyalty and love are steadfast for the Texas ebony.

The Texas ebony (*Pithecellobium flexicaule*) is a native of southern Texas and Mexico. It is a large broad-leaved shrub, or small tree, usually not attaining a height above 30 feet. It is a rounded top tree with dense, dark green foliage.

EDITH SORGE, originator of *The Bonsai Farm in Adkins, Texas* and founder of the *San Antonio Bonsai Society*, has appeared on television, conducted workshops and classes and published articles on bonsai.

Texas ebony blooms once a year, generally after a summertime rain, at which time it also drops its ripe seeds. Blooms are golden puffs in spikes followed by beanlike seedpods four to six inches long by one-half to one inch wide, containing many dark reddish brown seeds. Seeds have an extremely hard coating. Leaflets are one-eighth to one-quarter inch, round, arranged feather-fashion on small twigs, usually three to five pairs of leaflets to each two- to three-inch twig. Leaves fold up and droop at night and on dark days, even indoors when under lights.



The dark reddish seeds, left, and the leaves, right, of Texas ebony.

A tropical tree, the ebony will not tolerate temperature below 32° F.

It is one of the easiest plants to work with as it endures neglect and adapts to low light—although full sun is preferred. If underwatered, it will drop all its leaves but within a few weeks, when watered, will put on a new set of leaves.

It is sometimes advantageous to defoliate an older ebony once a year—during the summer—to give it a few weeks resting period. If this is not done it will defoliate itself every few years. First the leaves fold up, then droop and finally turn tan and fall off. It's disconcerting to watch so I find it less disturbing to defoliate it myself. It is even good for the plant to be defoliated prior to potting as it seems to go through this shocking experience much more easily.

When the plant is large enough to make into a bonsai, cut the branches back, decide the height and reduce the trunk height, if necessary. Before wiring, cut the ends off the thorns to keep from injuring yourself. The wire does not have to be wrapped, especially if you use aluminum wire. Wire in the spring and summer and pot during the warm growing season. Style as an informal upright or a cascade if you find one with a low branch. Prune any time during the growing season to achieve the desired shape.

The soil mixture is not critical. I have seen them growing and thriving in black claylike soil. Our soil mixture consists of fine bark, peat moss, coarse blasting sand and Turface. (The only mix which it

seemed to resent was bark and perlite, with the perlite being predominant. In this mix the leaves turned a pale green and very little growth was noted.) The trees grow naturally in black loamlike soil. I must deduce that the Texas ebony likes a heavier mixture than many other bonsai.

I usually choose glazed pots for this bonsai since it has such pretty dark green leaves and is not deciduous. I like the blues, greens and whites best.

Texas ebony may be grown indoors very successfully, either near a window or under artificial light. Although it loves full sun, it has been observed in one office on a desk at least fifteen feet from the nearest window. It was not thriving but it was growing. Perhaps lack of fertilizer may have been the reason for little vigorous growth. Fertilize with a well-balanced water-soluble fertilizer once a week or use a time release fertilizer. We use both with ours, wanting them to grow rapidly.

If you have a small plant, place it in a large nursery can, supply water with continuous drip and fertilize two to three times a week. If this method is used it will grow into a large plant in just a few years. If placed in a bonsai pot while small, it will tend to stay small as the pot restricts the roots. Repot every two or three years and root prune lightly.

The only pests we have noted have been scale, which we hand pick from the plants. It is not normally subject to fungus root rot though we treat all of our plants with Benomyl, or similar product, to prevent root rot. 🌱

A TROPICAL BLOOMING AND FRUITING BONSAI

MURRAYA PANICULATA, ORANGE JESSAMINE

HEIDRUN HUNGER

Murraya paniculata is a member of the Rutaceae. A native of South China, India, Indonesia and Australia, it is a large evergreen shrub with a sometimes tree-like growth habit. It can reach 10 to 12

feet high. Its leaves have three, and up to nine, broad to ovate round, toothed or toothless, small (one- to two-inch long) leaflets. They are glossy dark green which gives a graceful contrast to the light-colored bark. The bark is used for cosmetic purposes. The white flowers are bell-shaped, fragrant, appearing in clusters. The red fruits contain two seeds.

HEIDRUN HUNGER is a horticulturist in Leipzig, specializing for the past ten years in tropical bonsai.

Vegetative propagation is possible through cuttings, but high bottom temperature of 28-30° C (80-86° F) and high humidity are required. Seeds have highest germination rate right after they have reached maturity. The fruits are washed and seeds are separated from the fleshy fruit capsule. Seeds are planted in a mixture of equal parts sand and peat moss (1:1) and placed in a warm location of 20° C (68° F). The soil mixture should be kept moderately moist. Germination takes place in one to two weeks. When the plants reach the two to three leaf stage, the young plantlets are transplanted into two-inch pots with a porous nutrient-rich soil mixture. Filtered sunlight through east or west windows is beneficial. Direct sunlight and southern exposure should be avoided. During the first two years, maintain normal growing conditions: Transplant into large pots and, if necessary, fertilize April to September every two weeks and keep the temperature constant during the entire year at 20° C (68° F). Under these optimal growing conditions the plant will produce its first flowers. It is advisable to remove all faded flowers, since fruit development will weaken the plant.

During spring of the third year of normal growth, the main lead can be wired and bent to a cascading side branch. At the highest point of the cascade a new shoot will become the main lead. Through this technique the lower twigs can be arranged to a graceful *Moyogi*.

Hardwood development starts in the early stages of young shoots. The wood is very brittle and will break easily when shaping the plant with wire. It is better to achieve the desired form through pruning. Another way is to fasten wire under the rim of the pot and slowly bend the branches down into the desired position;

the wire will not imbed in the bark of the wood. The pruning can be done year round.

To shape a young *Murraya* bonsai, remove five leaves after the young shoots have developed eight to ten leaves. During that growing period the hardening of the young shoots occurs. With this practice a better-balanced bonsai can be achieved. New shoots will be developed from axillary buds. For a delicate form of the individual branches, prune back to the second leaf of a new shoot after it has developed four to six leaves. Usually at this growing stage flower buds will set. Keep this in mind during the slow process of shaping the bonsai. Over the years the distance for flower buds gets shorter. It is not rare to have 10 to 12 single flowers on one branch. The single flowers last no longer than one to two days. But since not all flowers are open at the same time, the delicate jasminelike fragrance can be enjoyed for a longer term. Shortly after flowering, the small green fruits are visible. Within a half year fruits ripen and turn from green to orange to red, and can reach the size of a cranberry. Not all fruits will reach maturity; most of them will drop off. The few which reach full maturity decorate the shrub with their bright color for about a month. Quite often there are flowers, young and mature fruits at the same time on the plant. This adds a special charm to the bonsai!

Beginning at the fourth growing season, the plant can be transplanted to a shallow bonsai dish. At this time some of the well developed main roots can be pruned back. The plant generally does not have a strong root system, therefore a drastic pruning of the roots is not required. Most of the old soil should be removed. The plant can be easily positioned into the new dish and fresh humus-rich soil should

be added. Maintain enough moisture, but do not overwater. The root system should be evenly moist.

plants. It can lead to total leaf loss. Full recovery is difficult for the plant. Be prudent with leaf pruning. Older plants have longer internodes between single leaves, therefore leaf pruning is not necessary. 🌿

SUCCULENT BONSAI

C. GLASS & R. FOSTER

To the average plantsman the combination of "succulent" and "bonsai" seems an incredible conflict of terms. Succulents are plants one can grow with little care and bonsai is an art which often demands daily attention. Succulents often (perhaps too often) have a wild, rank,

unkempt look, and bonsai is the epitome of meticulous, painstaking, traditional cultivation. But if one looks at the two situations from a slightly different angle, that of overall effect, there are striking similarities.

Some of the best bonsai plants are those that have been naturally dwarfed



Ficus neriifolia grove.

(miniaturized) by the site and conditions under which they grow in the wild. Some succulents in the wild endure virtually the same conditions, and in some cases with a very similar effect. The branches of a succulent tree in the desert are often pruned by hungry, grazing animals or pinched back by frost, and shaped by sun and wind. A succulent's roots are often impeded in their growth by growing in a too-small pocket or rock crevice, or by a lack of moisture in the soil.

The beauty of the succulent bonsai is not only in the graceful or grotesque, contorted shapes, but in the fact that it does not need daily watering! One can leave a succulent bonsai unattended for days or even weeks without major ill effects.

If one is fortunate to obtain a plant which is naturally "bonsaied" by conditions in the wild, it's a fairly easy and enormously rewarding job to maintain this bonsai quality in cultivation.

Perhaps the species most ideally suited for this "succulent bonsai" treatment are the various species of "Elephant tree," of the genera *Pachycormus* and *Bursera* or *Commiphora*, but several other plants may be used equally effectively—succulent species of the *Ipomoea*, or Morning Glory tree from Mexico; some of the sedums such as *Sedum frutescens* or *oxypetalum*; some of the mesembs, such as *Trichodiadema densum* or *bulbosum*; and even some cacti, such as old-gnarled specimens of *Opuntia ramosissima*.

Select a shallow container that will not keep the soil wet too long. The best container is the traditional Japanese bonsai pot, not only for its aesthetic appeal and

elegant lines, but also because it provides excellent drainage, the proper proportions and because it is made of good clay, high fired and made to last.

Watering requirements are not too different from the average succulent—they can be soaked thoroughly and then, unlike regular bonsai, allowed to dry out considerably before the next watering. The most important element in the care of succulent bonsai is constant and careful pruning and shaping.

Most of the new growth should regularly be removed at least back to the first or second node (or bud). The crown should be opened up by removing much of the inside growth. Suckers on the trunk and underside of the branches should be cut off, and even major branches may be removed to create a more pleasing, artistic effect, but should never be crudely hacked off leaving an ugly stump; remove such branches close to the trunk and the cut will heal in a very natural fashion, enhancing the appearance of the plant. Neither should one prune the plant from just one angle, but repeatedly rotate the plant while working on it, so that the final effect will not be one-sided. Just remember at all times that you are trying to create the effect of a normal tree but in miniature. The result will not, in most cases, measure up to the strict traditions of the true art of bonsai, but it takes much less work, much less training, yet affords very much the same pleasure and satisfaction. 🌱

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WIRING TECHNIQUES

THIS



Correct wiring

NOT THESE



Spaced too widely—won't hold position



Uneven—won't hold position



Too loose—won't hold position

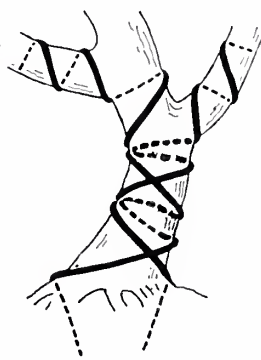


Too tight—scors form quickly

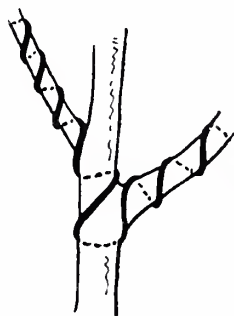
Use no. 10 to no. 26 copper wire, depending on branch thickness and stiffness. Soften larger-size wires by bringing to a red heat in a flame and letting cool gradually. Once coiled around a branch, softened wire soon hardens.



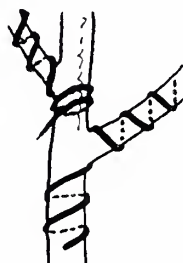
Correct: Parallel wires wound close together



Wrong: Crossed wires have little holding power



Correct: Two branches coiled with one wire



Wrong: Won't hold as well, and tree looks over-wired

Begin wiring at bottom of tree and work upward. If trunk is to be wired, anchor wire ends by pushing down through root ball to a bottom corner of container. Avoid sheathing a tree in wire; good wiring practices give best results with least wiring.



PORTULACARIA & OTHER SUCCULENTS FOR BONSAI

JAMES J. SMITH

Many people have been growing succulents as bonsai, but not much as been written on the subject. Since succulents are some of the easiest plants to grow and are very tolerant of extremely dry conditions, they are ideal plants for the beginner or for anyone who can't or doesn't water his plants every day. I am not recommending that you neglect succulents. They do respond to good care and if you give them ideal growing conditions, they will reward you by being healthy, good-looking plants. Since they are "survivors" they will live under adverse conditions and tolerate some neglect.

Succulents are plants adapted to survive with less-than-average water supply by storing water in specially enlarged spongy tissue in their leaves, branches, trunk and roots. Some plants use just the roots for storage—such as *Trichodiadema bulbosum*. *Ficus salicifolia* uses its roots, trunk and branches for storage, but *Bursera* uses just the trunk and branches. Jade plant uses the trunk, branches and

leaves, and *Portulacaria* uses all parts — roots, trunk, branches and leaves. Naturally there are different degrees of succulence. *Ficus* may live for days or weeks without any water, whereas the jade plant may live for months.

The length of time a plant can live without available water depends much on the health of the plant, environment, light, humidity, temperature and wind. A plant grown in low light indoors or full shade outdoors needs less water than one growing in light shadow or full sun outdoors. Indoors, light intensity varies, depending on location, size of windows and distance the plant is from the window. Humidity has a lot to do with how often a plant needs to be watered. Plants give up most of their moisture through their leaves. In high humidity, plants will transpire less than in low humidity.

Although succulents differ from other plants in their ability to withstand drought, requirements are basically the same as for other plants and they must be provided with an environment suitable for their needs. Since most succulents are tender plants they require temperatures above freezing. Most will tolerate extremely high temperatures. Light requirements will vary. The jade plant

JAMES J. SMITH owns and operates a nursery in Vero Beach, Florida and is an expert on bonsai growing. He writes articles, gives lectures, demonstrations and instruction in bonsai.



Jade plants make excellent bonsai.

will adapt to very low-light levels whereas *Portulacaria* thrives in bright light.

Soil and Potting

Soil for succulents is basically the same as for other bonsai: It must drain well and be heavy enough to support the plant. But since some succulents hold a large amount of water in their leaves and branches, they tend to be top-heavy. Thus the soil should contain a large amount of coarse sand or other heavy aggregate to support the plant. It is usually necessary to wire the plant to the pot until it becomes established. Before potting, let the soil dry completely, then use the dry soil for repotting, especially if any large roots have been cut. Make certain the plant is wired securely in the pot so it can establish itself without any damage to the roots later. Do not water the plant for several days or until the roots that were cut have calloused. If the roots of some succulents are not allowed to callous before watering, they may rot.

Portulacaria needs repotting every year while it is in training; after it has developed to your satisfaction it can be repotted less often. *Bursera*, on the other hand, grows extremely slowly and will not need repotting for ten years or more, depending on the size of the container. Although most succulents can live for many years without repotting, it is a good practice to check the roots each year to determine if the plant is potbound and in need of repotting.

Insects and Diseases

Insects and diseases have not been a problem with any of the succulents mentioned. If you should have to spray, always follow the directions on the label. Most plants tolerate insecticides. *Portulacaria* does not like any pesticide with a petroleum base. If you need to spray any plants that usually will not tolerate a pesticide, test spray a junk plant in a shaded

area or, better yet, spray after sundown or on a cloudy day when the temperature is not too high. You may need to wash the chemical off the foliage after a short time. If the plant won't accept the treatment, you may try spraying with soap and water. It is still advisable to spray in the shade and then rinse thoroughly with fresh water from your hose. Use as much pressure as is safe for the plant.

If the plants are small you may wish to dip them a bucket of soap solution and then rinse. If you accidentally spray a plant with a harmful chemical, wash it off immediately with fresh water. Usually no harm will be done.

Propagation

Propagation of most succulents is extremely easy. Many will start from leaf cuttings. A leaf from a jade plant that has fallen to the ground will take root and produce many plants without any effort.

Almost any size cutting can be used; always take cuttings from healthy plants. Let the cut end dry thoroughly in the shade (usually 24 hours is sufficient) before inserting them in moist rooting medium. Another method is to insert the cutting into a dry medium immediately after they are taken from the stock plant.

It is important not to water the cutting until the cut end has dried. the cutting should be placed in a shaded area, protected from strong winds until rooted, gradually moved to brighter light and then fed liquid fertilizer. After they have developed a heavy root system, transplant into training pots. Arrange the roots carefully, keeping in mind the style of bonsai you desire. The rooting medium may be the same soil you use for potting.

Style Training

Succulents can be trained in many bonsai styles. The *Bursera* and jade plant are naturals for informal upright; *Portu-*

lacaria can be trained as a formal upright, cascade or anything in between.

Pruning

Pruning most succulents is slightly different from woody plants. The soil should be allowed to become very dry. When removing a branch, do not make the usual concave cut. Instead, cut flush with the trunk. Usually after the cut has dried, the thin layer of tissue protruding from the trunk will fall off. If not, another cut closer to the trunk may be necessary. Since succulents are not woody until they are very old, pruning with bonsai scissors is very easy. Pinching can be done with the fingers and must be done faithfully in order to develop a fine bonsai.

Portulacaria grows very fast. It is necessary to pinch every week during the growing season. When pinching, always keep in mind that new growth starts at the base of the leaf. If you want vertical growth (top of tree), pinch to vertical leaves. You can always wire the branch and twist it in the direction you want it to grow. Leaf pruning can be very effective on the jade plant; regular weekly pinching on *Portulacaria* will reduce them to one-fourth of their regular size. Since their leaves are normally smaller, *Portulacaria* is ideal for mame, or miniature, bonsai.

Wiring

Wiring is the same as with other plants, except that a thinner wire can be used on succulents. If you should crack a branch while bending, return the branch to its original position without removing the wire. It will heal in a short time. The branch can be very carefully bent later. When removing wire from succulents, it is safer to cut the wire in short pieces than to remove it in one piece, as is often done with other woody plants. I use copper-covered aluminum wire. It takes less effort to wire and I'm less likely to damage the plant.

Training *Portulacaria* in Bonsai Pots

Since I grow bonsai commercially, it became evident that to produce a respectable looking plant at a reasonable cost, I would have to reduce the growing time to cut the labor costs.

Portulacaria provides possibilities for commercial bonsai because it may be started from leaf cuttings and is fast-growing. Instead of using rooted plants, start with unrooted cuttings and root them directly in the bonsai pots. Some styles, such as group plantings, can be developed in one year or less, while a formal upright will take longer.

The potting soil I use here in Florida is a general nursery soil made up of Florida peat and cypress chips that has been screened through a half inch mesh to remove the larger particles. (Use these larger particles as bottom soil in deeper pots.) Add 50% coarse sand and a slow-release fertilizer with minor and trace elements. Using dry soil allows me to plant the cuttings immediately.

Before planting the cuttings in the pot, do all necessary pruning and wiring because it will be impossible to do any wiring later on—until they are rooted. Our objective: Shorten the training time. If you have a large supply of stock material, much of the training can be done while on the stock plant. Choose your cuttings carefully so by the time they root you will be well on your way to having a bonsai.

After your cuttings are prepared, insert them in the bonsai pots that have been filled with soil. The potted cuttings are placed on a bench under 50% shade cloth.

One or two days later they are watered for the first time. The soil is then kept slightly moist until they have rooted. After they have rooted well, feed with liquid fertilizer regularly for fast development.

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Ficus benjamina 'Exotica' showing aerial roots.



FABULOUS FICUS

JAMES J. SMITH

The genus *Ficus* has many species suitable for indoor bonsai: *F. benjamina*, *F. benjamina* 'Exotica', *celebensis*, *citrifolia* (short-leaved fig), *microcarpa* (green island), *philippinensis*, *salicifolia* (willow-leaf fig), *triangularis*, *retusa* (Chinese banyan), *rubiginosa* (rusty fig), *aurea* (strangler fig).

As well-established trees, the above species are able to withstand a severe drought. Aerial roots are easily developed on all of these except *F. celebensis* and *F. triangularis*. Most will tolerate a low light (indoor) environment and can be trained with the clip and grow method. Repotting is easy because drastic root pruning is safe for most *Ficus* spp.

Location

Light is usually the limiting factor for growing plants indoors. Although *Ficus* will tolerate low light, a location near a window with bright light will produce healthier and more compact foliage. A south window is the best choice. The second—providing that none of the windows are shaded by trees or other obstructions—is an east or west exposure. If this is not possible, grow lights may be substituted. (See articles on *Growing under Artificial Lights*, page 4 for detailed information.)

Watering

Most potted plants prefer a moist soil and *Ficus* is no different. A good rule for watering any potted plant is to water thoroughly (soak the soil) until all the air is removed from the soil. Then let drain until water ceases to drip from the drainage holes. Do not water again until the soil approaches dryness but is still moist.

Schedule your watering to meet the needs of the specific plant—which may be every day, every other day or once a week. If a plant is moved, the watering schedule may have to be changed. Plants growing in bright light will need more watering; a tree that has been defoliated will need less—until new growth appears. More water is needed when the plant is growing; you'll need to schedule watering according to the season. And keep in mind that individual plants grown in different soil mixes will have different watering requirements.

Insects and Disease

Ficus are relatively free from insects and disease but no plant is completely immune. Learn to identify plant problems. Inspect your bonsai each time you water them and if you suspect a problem, examine the leaves in bright light—especially the undersides using a 5X magnifying glass. Some pests are as small as 1/100th of an inch long. Most problems show up on the leaves: leaf curl, discoloration, leaf spot, powdery growth, wilted leaves and leaves chewed by insects. The woody parts of the tree should also be inspected for insects and for rot.

It is important to identify the pest and then use the correct treatment as soon as possible. When using any pesticide, always follow the directions on the label at the strength directed. If in doubt, ask a knowledgeable grower or your County Extension Agent.

Fertilizing

Any all-purpose fertilizer that contains micronutrients is recommended. Liquid fertilizers are quick-acting and must be applied more often than dry fertilizers. During the growing season, apply weekly if growing outdoors; monthly if indoors. Insect-free foliage that is paler than normal in color indicates that the tree needs fertilizer, whereas darker green foliage shows it does not.

Granular fertilizers are available in quick-acting and slow-acting formulas and may be applied either to the surface of the soils or mixed in with the soil when potting the tree. When using quick-acting fertilizer, always make sure that it is distributed evenly over the soil surface so that it does not burn the roots. And never use more than the directions indicate. Care in watering is needed so as not to wash the fertilizer from the soil.

Some slow-release fertilizers are available in the form of tablets, sticks or briquets. These are placed below the soil surface and release their nutrients as soil conditions change. Some are governed by the bacterial action in the soil, others are made available to the tree by the amount of water given the soil. These products will probably last anywhere from two months to two years, depending on the product selected and your growing and watering conditions.

Organic fertilizers are slow release and depend on bacterial action to make them available to the plant. They need to be applied about every two months.

All dry fertilizers can be mixed or supplemented with liquid fertilizers. Always use as directed. Again, if in doubt, seek advice. Plants growing in full sun need more fertilizer than those growing in shade; adjust your fertilizing schedule accordingly.

Repotting Ficus

Bonsai need repotting when the pot is filled with roots and, if not done, the excess roots will cause the tree to rise in the pot.

A *Ficus* bonsai growing outdoors in South Florida may need repotting each year, whereas the same tree growing indoors in New York may not require it for five or more years.

Spring and summer are the optimal times to pot *Ficus*, although with proper care and good health, it may be done any time of year. Most healthy *Ficus* will tolerate drastic root pruning.

When repotting, shorten all branches as needed to maintain the desired shape of the tree. Remove all leaves and terminal buds (an exception might be a weak branch or one that needs additional growth). The steps and soil and watering requirements for repotting *Ficus* are the same as for other bonsai.

Training

The size and shape of the *Ficus* tree can be maintained by pinching the terminal bud of any branch when it reaches the desired length. Continue pinching throughout the growing season, leaving one or two new leaves. You can direct new growth by pinching back to buds aimed in the direction you wish new growth to take. Wire can be used to change direction of heavier branches.

Propagation

Ficus are easy to propagate from cuttings and air layering. One method that is of interest to bonsai growers is root cuttings. The procedure is simple.

A root system that has been removed by cutting horizontally across the entire root ball of a large *Ficus* should be planted intact so that the cut ends of the roots are even with the surface of the soil. Keep in a partially shaded location until

new growth appears at the cut ends of the roots. Then move it to a more sunny location. Water requirements are the same as for other bonsai.

A forest or group planting can be created from the vertical stems growing from the root cuttings. As the planting develops, remove all the unwanted growth, leaving only the trees you want to keep. Trim the trees so that each one of them is a different height. The diameter of the trunk will determine the height of the tree; thickest trunk will be the tallest, thinnest trunk, the shortest. After the planting has developed sufficiently remove enough roots so that it can be planted in a shallow tray. The root system that was removed can be used to start a new group planting.

Aerial Roots of Ficus

Those of us who have had occasion to be in the tropical areas where figs grow have been impressed with their natural tendency to grow aerial—or pillar roots. The name given to any type of tree that exhibits aerial roots and forms a grove is Banyan.

Most figs naturally tend to be upright trees, covering large areas of ground by spreading laterally. They can do this by dropping aerial roots and transforming low-arching branches into tree trunks that are all interconnected. In many areas one can see *individual trees* that cover *acres* of ground by this process.

Aerial roots are very attractive and will form naturally on bonsai plants that are grown in high humidity and shade; and from older, more mature wood. Articles have been written on how to encourage *Ficus* to develop aerial roots. Many techniques will work but not all in a reliable fashion. The most successful way to develop an aerial root is to graft a seedling. Graft onto an area of the mother plant that would be most attractive.



CHINESE ELM BONSAI

RANDY BENNETT

Growing Chinese elm (*Ulmus parvifolia*) for indoor bonsai is very rewarding. There are several reasons which account for its success: First, its adaptability to a wide range of climatic conditions; second, it develops quickly, allowing the creation of good bonsai in a relatively short time; third, Chinese elm is easy to obtain (readily available from landscape and garden nurseries due to its popularity as a landscape tree); fourth, it is resistant to disease.

Characteristics

Chinese elm is often referred to as the Chinese evergreen elm. This is due to its tendency to retain its leaves through much of the winter in southern regions where temperatures are mild. In fact, some of the Chinese elm cultivars may retain leaves for several years before losing them.

Ulmus parvifolia is a subtropical tree native to parts of China, Korea and Japan. It is recognized by its nearly smooth bark that exfoliates in thin scalelike layers. The leaves are one and a half to two inches long, obovate and serrate. It flowers and fruits in the fall. Trees may reach heights

of 60 feet (18 meters) if given enough time and space. Chinese elm has a natural growth pattern which forms multiple branches from the same point on the trunk and continues to ramify into the basic broom style. Although this is its natural tendency, it in no way resists being styled into any bonsai design.

Chinese elm and its cultivars develop thick root structures quickly and give young trees the desirable appearance of age. The thick roots are also very pliable and make this species one of the easiest to work with when creating root-over-rock and root-on-rock designs.

Ulmus parvifolia may be propagated from seed, branch cuttings, root cuttings, or air-layering. I have successfully propagated Chinese elm from branch cuttings over an inch in diameter. Some of the cultivars are more difficult to propagate from cuttings, but if you can locate a source for Hormex or Hormodin rooting powders¹, the job will be a simple one.

Chinese elm started from seed will develop a long single taproot. If the taproot is cut back drastically when the seedling is two to three years old, it will throw out radial roots which will thicken quickly to form a good base. Cuttings and air-layers develop radial roots at the out-set and only need routine pruning to encourage their proper development.

RANDY BENNETT is a school teacher and artist with a keen interest in bonsai. He is editor of the *New Orleans Bonsai* magazine.



Ulmus parvifolia 'Seiju' forest planting using branch cuttings in root-on-rock style. Tallest tree is five and a half inches tall and three years old.

Cultivars

There are numerous cultivars of Chinese elm. Each cultivar has unique and interesting characteristics and all exhibit desirable qualities for use in bonsai. Some of the more easily obtainable cultivars are listed below.

'Catlin'— A dwarf cultivar with smooth bark. Leaves are thick, dark green, obovate, crenate and shiny; from one half to three fourths of an inch long. Good branching characteristics. Moderate to fast growth. Trunk thickens slowly.

'Cortica'— A semidwarf variety whose bark is rough and corky with deep vertical furrows. Fast growing shoots may exhibit corky wings. Leaves are rough, obovate and are from one to one and a quarter inches long.

'Drake'— A semi-dwarf elm with

smooth bark which exfoliates when mature. Dark green, obovate, crenate leaves from one to one and a half inch in length. This species exhibits a weeping habit with good branching. Fast growing.

'Frosty'— A smooth-bark, dwarf, shrub-type cultivar with leaves variegated only along the edges. Leaves are obovate, serrate and from one and a half to two inches long. Good branching characteristics. Medium growth.

'Hokkaido'— A miniature cultivar with extremely thick, rough and corky bark. Leaves are orbicular, crenate and one sixteenth to one eighth inch in length. Excellent twigging. Slow growing.

'Seiju'— A dwarf cultivar which develops very corky bark with deep vertical fissures even on young trees. Leaves are obovate, crenate and from one quarter

to one half inch long. Excellent twigging. Fast growing.

'Stoney's Dwarf'— A dwarf variety similar to 'Seiju' but with slightly larger leaves from one half to three quarters of an inch in length. Bark is more knotted in appearance and without vertical fissures. Good twigging. Medium growing.

'Suberosa'— A semidwarf cultivar with very rough corky bark. On a tree with a two and a half inch diameter trunk, about an inch is bark. Leaves are rough, obovate, crenate and from one to one and one half inches in length. Good twigging. Medium growth.

'Yatsubusa'— An unusual dwarf variety with rough bark that forms much thinner bark than the other cork bark cultivars. Leaves are spatulate, crenate and from one half to three quarter inches in length. This is a weeping cultivar with excellent, very delicate, almost lacelike twigging. Moderate growth.

Soil

Ulmus parvifolia originated from the lower elevations (under 1,000 feet) of southern China along the river regions. It thrives in a soil high in organic matter. In bonsai, however, soil requirements must balance with good drainage, especially in the indoor environment. *The number one cause of indoor plant death is overwatering in soil that has poor drainage.* Therefore a proper soil mix is the single most important element in indoor bonsai culture.

The more ingredients you use, the more difficult to discern what changes to make if your soil mix has problems. You must, therefore, keep the mix simple. I use two ingredients for my indoor Chinese elms: 1. pine bark mulch sifted through a quarter inch screen. This provides nutrients as it breaks down and retains moisture in the soil. Avoid using peat moss or any other organic material which is too fine. It will become packed in the soil, inhibit air circulation, retain too

much water and thus cause root rot. 2. haydite. It is the "sand" used in the manufacture of cinder blocks. I sift it through an eighth inch screen and eliminate anything which falls through a sixteenth of an inch screen. It has all the qualities of an excellent drainage material.

The drainage material is even more important than the organic. Avoid materials which have a smooth or polished surface. They do not provide surface adhesion for water and air. Also avoid drainage materials which are *flat* such as some of the expanded clays. These will tend to pack down in layers with each watering and stratify the soil, preventing air circulation and poor water adhesion. Use a material which is angular and has a rough surface or one which is filled with tiny holes (as haydite).

I provide the elms I keep indoors with a 60% haydite/40% pine mulch mixture. These proportions work excellently given the amount of humidity, light, temperature, air circulation and the species. The mixture that is right for you will depend on the climate in your area and the environment in your home. But do not spend a great deal of time worrying over it. It is the nature of *Ulmus parvifolia* to adapt to conditions which may be too wet or too dry for other species.

Humidity

The warmer you keep your home during winter, the greater the need for supplemental humidity. The means of increasing humidity for Chinese elm is standard for all bonsai. (EDITOR'S NOTE: Please see the article on Humidity, page 52.)

Temperature

Ulmus parvifolia is a subtropical tree. Subtropicals typically need a winter temperature of between 41° and 54° to provide the needed *resting period*². Here again is where the Chinese elm shows itself to be the ideal tree for indoors. It will tolerate

winter temperatures of between 64° and 72° while still maintaining its period of rest. Just remember that during the winter the Chinese elm needs at least six weeks of rest and you should help it out by keeping the room as cool as possible.

Although Chinese elm is a subtropical species it is hardy to Zone 5. Zone 5 indicates that the average low winter temperature for that region is between -10° and -20°F. Some of the cultivars mentioned, however, are not as winter hardy as *Ulmus parvifolia*.

Watering

The frequency of watering will be determined by the soil mix and how quickly it dries out. The best practice with Chinese elm is to allow the soil to dry out somewhat and then water again. Otherwise its care is the same as for other bonsai. (EDITOR'S NOTE: Please see the article on Watering, page 28.)

Location & Light

Three things must be considered when siting Chinese elm indoors: the cultivar, air circulation and light. Which cultivar you are growing will dictate to some extent where it must be placed. The smaller the leaves, the more light is required by the tree. So if you are growing *Ulmus parvifolia* 'Hokkaido' you will need as much light as possible. Conversely, the larger the leaf, the less light required for proper health. The variegated cultivars also require less light than their counterparts.

Air circulation is essential to the health of Chinese elm indoors. Air movement allows the exchange of carbon dioxide with the cells inside the leaves. Your elm uses the energy from light to split water so that the hydrogen atoms can bond with the carbon dioxide to form a carbohydrate molecules which the elm uses for food. If the air circulation is poor where your elm is located, it

may not be getting the carbon dioxide it needs. *Thus, your elm's health and its ability to produce food is more often affected by a lack of carbon dioxide than light.*

Your elm will use light to convert carbon dioxide and water into sugar. The sugar that is manufactured is the stored energy that feeds the tree. This photosynthesis can only be performed in certain light and is dependent upon the level of carbon dioxide present in the air, amount of moisture and temperature.

Although the manufacturing of food can only take place in light, your elm can use its stored energy anytime—including at night! This can affect your elm in that it will begin using its stored energy if not receiving enough light. When the tree has used all its stored energy, it begins to consume itself. This will be evidenced through pale leaves and weak, spindly growth. A lack of light may also cause yellowing and dropping of leaves, particularly at the bottom of the tree. Providing artificial light to maintain the health of your Chinese elm is a simple task, but there are several things which need to be kept in mind.

First, your elm will only utilize certain wavelengths of light. The red, blue and violet wavelengths are responsible for plant growth. Second, incandescent light bulbs are not suitable for providing light. Their light does not have the necessary spectrum for plant growth and the heat they emit will damage your tree.³ Third, if you use artificial light to supplement existing natural light, exposure should be between six and eight hours. Fourth, where artificial light is the only source, the duration of exposure should be between 10 and 16 hours. Automatic timers insure consistent exposure even when you are away from home.

I have my Chinese elms in my living room in three different locations. I utilize a row of east-facing windows using a combination of natural light and about

six hours artificial. A north-facing sliding glass door is used where there is only indirect light and so I rely on fluorescent lights more heavily—about 10 hours. A third site is a brick planter extending out from the wall by the front door. This area receives no natural light so fluorescent light is the only source—for a duration of about 16 hours.

Once you have selected your site, there are a couple of ways to improve the lighting. First, keep the windows clean! Dirty windows can cut down the transmission of light by as much as 40%. Second, increase light reflection by painting white the surfaces that surround your tree—such as shelves, side panels and the area behind any artificial light. You might also try a light-colored curtain behind your trees (which would also serve to block the hot, dry air from heating ducts in winter, and provide a cooler microclimate for your trees).

Do not forget to move your trees around. Rotate them from site to site if they are in areas of diverse light and temperature. That way each tree benefits from its "fun in the sun." Also remember to turn your trees if you are not using any artificial light. Otherwise the trees will tend to grow toward the window and you may lose foliage or even entire branches.

Styling

The natural growth pattern of Chinese elm is in the broom style with no central leader. However, this species can be styled into other bonsai designs. It develops fine twigs and branches and beautiful canopies of tiny delicate leaves.

Wiring is best done in early spring before buds begin to swell. Be sure to keep an eye on wired branches as initial spring growth is quite rapid and branches may be damaged by leaving the wire on too long.

General pruning can be carried out

any time of year. If, however, you are removing a major branch, wait until early spring before buds swell.

Fertilizer

Chinese elm responds well to any of the typical fertilizers recommended for bonsai. The best practice is to vary the type of fertilizer. No two fertilizers are exactly alike. Some may contain certain minerals or trace elements absent in others, even though the primary ingredients may be of the same type and proportion. Fertilizer may be applied at any time during the growing season, April to September, but remember that your elm must undergo a resting period so avoid fertilizing during late fall and winter.

Containers

The container used for *Ulmus parvifolia* will depend upon the bonsai style in which it has been trained. They look equally at home in glazed or unglazed containers. I tend to favor oval to rectangular containers because elms develop such soft rounded canopies and delicate, airy foliage. If a glazed container is used, a shade of green complements the color of the foliage. Glazed containers may also be useful if you have a problem with the soil drying out too quickly. The glaze helps to slow evaporation through the pottery surface.

Diseases and Pests

The number-one cause of indoor plant death is overwatering. Number two is underwatering. Number three, too much fertilizer. After that, it is a toss-up for which comes next—not enough light or too much light, temperatures that are too high or too low, too much humidity or not enough.

When any of these things happen, alone or in combination, the tree is weakened. It is in this weakened state that a tree is susceptible to insect attack.



Ulmus parvifolia 'Yatsabusa' trained in the informal upright style for one year and then placed with the roots over a rock for one year.

The tree was taken from a branch cutting and stands six inches above the glazed container.

Seek to prevent the cause of insect infestation and not simply the symptoms ridding of the infesting agents.

Ulmus parvifolia is highly resistant to disease and pests. But if chemical treatment of your Chinese elm is necessary, you may use any of the usual insecticides for treating elms, but with this caution: Do not use at the recommended strength on the various cultivars. The foliage of most of the cultivars is too sensitive to normal doses of Diazinon and may defoliate the tree and cause severe damage or even death. Malathion or insecticidal soap may be used without worry.

Insects and diseases will usually attack a plant where it is weak or damaged. It is therefore important to keep the tree "clean" by removing dead leaves and dead

branches and twigs. Areas such as these create ideal breeding places for pests. 🐛

¹ A source for both is Mellingers at 2310 West South Range Rd, No. Lima, Ohio 44452. Rootone is available at larger plant and garden centers.

² A dormant or rest period may be induced by combining a lower temperature with a shorter day length. Bonsai grown under lights benefit from the reduction of light from 16 to 12 hours a day and then gradually increasing the light back up to 16 hours a day. (EDITOR'S NOTE: For details on dormancy and resting periods, please see article *Resting Periods, Light Effects and Indoor Bonsai*, page 36.)

³ EDITOR'S NOTE: Not completely true. See articles on light. Use bulbs 25 watts or less.

151 PLANTS FOR INDOOR BONSAI

SIGMUND DREILINGER

The following list provides cultural requirements, and guidelines for winter care, for 151 bonsai. The list of plants has been compiled from many sources and the cultural requirements derived from the experience of many bonsai growers. These are not hard and fast rules, and certainly may vary under your conditions. Some

bonsai are deemed "easy" to grow and are so marked; others are "difficult" and are so indicated.

Light, humidity, fertilizer and watering needs during rest periods have been discussed elsewhere in this handbook — please refer to those articles for details. The following codes are used in the plant list for winter care recommendations.

WINTER CODES:

- CODE #1:** House temperature 55° night to 75° F day.
Good light needed, not necessarily sunlight.
- CODE #2:** House temperature 60° night to 75° F day.
As much sun as possible.
Supplement by fluorescent lamps burning for 14 to 16 hours.
- CODE #3:** House temperature cool 50° to 55° F night to 65° F day.
Needs good to very good light.
- CODE #4:** House temperature cool to cold; 40° to 50° F night to 60° to 65° F day. Very difficult to grow in average home.

ACACIA BAILEYANA—GOLDEN MIMOSA—Code 3
From Australia, has pinnate leaves and fragrant yellow flowers. Needs a cool winter temperature. Repot every two to three years.

A. DEALBATA—Code 3

Keep moist, water when top half inch is dry.

A. FARNESIANA—SWEET ACACIA—Code 2

Fragrant flowers. Can take warmer temperatures than *A. baileyana*.

ALBIZIA JULIBRISSIN—MIMOSA TREE—Code 3.

Bipinnate leaves, flowers are pink pompons – like powderpuffs. Bright light to induce flowering. Needs a cool winter. Difficult.

ARAUCARIA ARAUCANA (A. IMBRICATA)—MONKEY PUZZLE TREE—Code 1

Tolerates some dryness and winter heat. Keep moist, not wet. Slightly acid soil. Peat moss is good. Let become pot-bound.

A. HETEROPHYLLA (EXCELSA)—NORFOLK ISLAND PINE—Code 1

Not a pine. Needlelike leaves, wheel spoke branches. Culture as above.

ARDISIA CRENATA—SPEAR FLOWER—Code 2

Keep moist. High light intensity helps produce white flowers which become red berries.

A. CRISPA—CORAL BERRY—Code 2

Culture as above.

A. JAPONICA—MARLBERRY—Code 2

Culture as above.

BAUHINIA BLAKEANA—HONG KONG ORCHID TREE—Code 1

Large two-cleft leaves; can reduce. Purple flowers resemble orchids in late win-

ter and spring. Water sparingly in winter. High light helps flowering.

B. PUNCTATA—RED BAUHINIA—Code 1

Dwarf variety. One inch leaves and white flowers.

B. VARIEGATA 'CANDIDA'—ORCHID TREE—Code 1

White flowers

BOUGAINVILLEA GLABRA—PAPER FLOWER—Code 2

A vine which develops a rough-bark trunk with age. Very showy bracts with small inconspicuous flowers. Many color varieties. Water well in summer. Keep on dry side in winter to induce flowering. Too much water or cold will cause leaf drop.

BRASSIA ACTINOPHYLLA (SCHEFFLERA ACTINOPHYLLA)—AUSTRALIAN UMBRELLA TREE—Code 2

A vigorous grower that takes reduced light. Tolerates heat. Has large leaves that will reduce. Keep moist. Train by grow and clip. Easy.

BUCIDA BUCERAS—GEOMETRY TREE, BLACK OLIVE—Code 1.

Larger leaves than *B. spinosa*; thorny, leathery leaves. Keep warm. Transplant only in hottest months – July & August. Give high light and keep moist.

B. SPINOSA—BLACK OLIVE—Code 1

A smaller leaved species with zigzag branches. Keep moist. Cut back and raise a branch to be terminal to get interesting trunk. Needs high humidity. Root prune only July or August. More desirable for a bonsai than *B. buceras*.

BUDDLEIA INDICA (NICODEMIA DIVERSIFOLIA)—INDOOR OAK—Code 1

Wavy lobed leaves reduce easily. Pinch



Serissa foetida 'Variegata'

PHOTO BY CHRISTINE M. DOUGLAS

frequently to induce branching. Keep warm, moist. Bright light.

BULNESIA ARBOREA—VERA, VERA WOOD—Code 2
From Columbia and Venezuela, S. America. Pinnate leaves, brilliant yellow flowers. Reduce watering in winter.

BURSERA MICROPHYLLA—Code 1
Culture as above. Slow grower.

B. SIMARUBA—GUMBO LIMBO—Code 1
Peeling light brown bark; compound dark green leaves. Large diameter cuttings root very easily. Tolerates high temperature and dryness. Fast grower.

BUXUS HARLANDII—CHINESE BOX—Code 1
Tolerates heat and dryness.

B. MICROPHYLLA JAPONICA—JAPANESE BOX—Code 1
Evergreen leaves; acid soil.

B. M. 'COMPACTA'—KINGSVILLE BOX—Code 3
Needs winter rest; don't overwater. Fertilize sparingly, keep on cool side. Very slow grower.

B.M. KOREANA—KOREAN BOX—Code 3
Culture as above.



Juniperus chinensis var. *sargentii*.

PHOTO BY CHRISTINE M. DOUGLAS

CALLIANDRA EMARGINATA—DWARF RED POWDERPUFF—Code 1

Pinnate leaves; flower buds like pink raspberries. Acid fertilizer and soil. Trunk thickens slowly. Keep moist. Needs high light to flower.

(* There is some confusion in the literature about the names of the dwarf powderpuff. Some sources say it is *C. haematocephala* 'Nana'.)

C. HAEMATOCEPHALA—Code 1

Larger than above. Culture as above.

CAESALPINIA PULCHERRIMA—FLOWER FENCE—Code 2

Pinnate, feathery foliage. Bright yellow flowers in panicles. After seed ripens, the tree reblooms. Don't overwater. Need high light intensity. No wet feet!

C. MEXICANA—CURLYPOD—Code 2

Culture as above.

CAMELLIA JAPONICA—CAMELLIA—Code 3

Must have cool nights to set flower buds. High humidity, acid soil. If kept too warm the buds will drop. Wood is stiff and brittle. Wire carefully. Difficult.

C. SASANQUA—Code 3

Culture as above. Difficult.

CARISSA GRANDIFLORA—NATAL PLUM—Code 3

Thorny bush from S. Africa. High light needed to flower. Has red, edible fruit. Keep moist. Will tolerate higher temperatures. Resents root pruning.

C.G. 'NANA COMPACTA'—DWARF NATAL PLUM—Code 3

A better variety for bonsai. Culture as above.

CASSIA AUGUSTIFOLIA—Code 1

Has narrow leaves. Prefers cool, but can tolerate higher temperatures.

C. MARILANDICA—SENNA—Code 1

Has compound leaves with yellow pealike flowers. With diffused light it flowers freely. Culture as above.

C. RENIGERA—BURMESE SENNA—Code 1

Has pink flowers. Culture as above.

CHAENOMELES JAPONICA—JAPANESE FLOWERING QUINCE—Code 3

Many-stemmed shrub. Needs cool temperature and bright light to induce flowering. Cold rest period in winter, water moderately. High temperatures can be offset by high humidity or misting. Difficult.

CHAMAECYPARIS PISIFERA 'PLUMOSA'—SAWARA FALSE CYPRESS—Code 4

Needs cool temperatures to 65–70 degrees F with cold winter temperatures of 45 degrees F. Give high light and keep branches open by careful pruning for maximum air flow. Keep on dry side. Very difficult.

C. P. 'NANA'—Code 4

Conditions and culture as above.

C.P. 'AUREA'—Code 4

Conditions and culture as above.

C. P. 'SQUARROSA'—Code 4

Conditions and culture as above.

CHRYSANTHEMUM FRUTESCENS—MARGUERITE—Code 3

Needs bright light. Provide cool temperatures in winter (45–50 degrees F) to bloom.

CINNAMOMUM CAMPHORA—CAMPHOR TREE—Code 2

Leaves are evergreen, aromatic, smell of camphor when crushed. Can be reduced. Trunk has fissured look. Grows easily but keep pH neutral to slightly acid.

CITRUS species—many varieties—all Code 3

Keep slightly dry, give bright light. Need a cool winter temperature and acid fertilizer. Supply trace elements occasionally. Water more when in active growth. White fragrant flowers.

Varieties: Seville orange, Meyer lemon, Grapefruit, Ponderosa, Otaheite orange.

X CITROFORTUNELLA MITIS—CALAMONDIN—Code 3

CLERODENDRUM THOMSONIAE—BLEEDING HEART, GLORY BOWER—Code 1

A vine with red flowers from W. Africa. Pinch new growth to maintain shape. Long flowering period. Water well.

COFFEA ARABICA—COFFEE—Code 1

White flowers followed by red berries. Needs high light and humidity to induce flowers and fruit. Do not allow to dry.

COCCOLOBA UVIFERA—SEA GRAPE—Code 1

Stands heat. Water when top of soil is dry, but do not overwater. Fruit is edible and makes a sweet jelly. Large leaves can be reduced.

CONOCARPUS ERECTUS—BUTTONWOOD—Code 1
Roots very easily in plain water in bright sun. Temperamental indoors. Will drop leaves in a draft or cold temperature. Give high light, high humidity and high temperatures and it will thrive. Breaks new growth easily on old wood. Collecting is prohibited on public lands. Moderately difficult.

CONOCARPUS ERECTUS SERICEUS—SILVER BUT-TONWOOD—Code 1

Has silvery gray leaves. Culture as above.

COTONEASTER MICROPHYLLUS THYMIFOLIUS—Code 3

COTONEASTER MICROPHYLLUS 'COCHLEA-TUS'—Code 3

There are many varieties and cultivars of cotoneaster. All have small leaves, many have white flowers and red berries. Give cool conditions and a winter rest. Good for mame bonsai. Difficult.

CRASSULA ARGENTEA—JADE PLANT—Code 2 -3

C. ARBORESCENS

C. SCIMIDTII

C. COOPERI

C. arborescens can take higher temperatures. Allow a dry cool rest in winter. Fertilize with a low nitrogen fertilizer. All need a very well drained soil. Water when soil is almost dry.

CRYPTOMERIA JAPONICA 'COMPACTA'—JAPANESE CEDAR—Code 3

Supply high humidity and cool temperatures. Train so that air and light penetrate between the branches. Difficult.

C.J. 'TANSU'—dwarf—Code 3

Culture as above.

CUPIEA HYSSOPIFOLIA—FALSE HEATHER, JAPANESE MYRTLE—Code 1

Small, very narrow leaves. Pink to purple

flowers in profusion. good light. Keep moist, do not allow to dry. Easy. Good for small bonsai.

CUPRESSUS ARIZONICA—ARIZONA CYPRESS—Code 3

Difficult indoors unless you can supply high light and cool to cold temperatures. Need 40°F in winter. Very difficult.

C. MACROCARPA—MONTEREY CYPRESS—Code 3

Conditions and culture as above.

CYTISUS RACEMOSUS—BROOM—Code 3

A shrub or hedge plant. Needs a cold rest in winter to flower. Give a bright light and alkaline soil and it will produce many yellow flowers.

EHRETIA MICROPHYLLA (CARMONA MICROPHYLLA)—FUKIEN TEA—Code 2

Can take 75 degrees F temperature. Shiny green leaves. Needs bright light to produce white flowers, followed by green berries that turn red when ripe. Keep slightly moist but supply good drainage. Does not like wet feet.

EUGENIA UNIFLORA—PITANGA, SURINAM CHERRY—Code 1

Shiny, evergreen leaves, fragrant white flowers, edible red fruit – like miniature pumpkins. Needs very good light, slightly acid soil. Keep moist. Use acid fertilizer. Easy.

E. BRASILIENSIS—BRAZIL CHERRY—Code 1

Conditions and culture as above although it can take higher winter temperatures.

EURYA JAPONICA—JAPANESE ELDERBERRY—Code 2

Needs warmth and moisture and good drainage. Dark green leaves, black fruit.



Left to right: Rosemary, citrus and Serissa summering outdoors.

FICUS

All varieties are good subjects for indoor bonsai. They can survive lower light levels. Some produce a dense canopy of leaves and aerial roots. Among the many varieties the following are recommended:

F. AUREA—STRANGLER FIG—Code 1

Develops aerial roots. Leaves reduce easily. Can take heat and some dryness in the house.

F. BENJAMINA—WEeping FIG—Code 1

Can develop aerial roots. Leaves reduce. A somewhat weeping habit.

F. DELTOIDEA (*F. DIVERSIFOLIA*)—MISTLETOE FIG—Code 2

Has smaller leaves. Fruits easily.

F. NERIIFOLIA REGULARIS—WILLOW LEAVED FIG—Code 1

Has narrow 1/4" leaves to 2" long. Will develop aerial roots. Stands reduced light, heat and somewhat dry soil.

F. PUMILA 'MINIMA'—Code 1

A creeping vine with small leaves. Very slow to develop a trunk. Good for mame bonsai.

F. RETUSA—BANYAN, INDIAN LAUREL—Code 1.

Field-grown specimens develop enormous trunks; will develop aerial roots.

F. RUBIGINOSA—RUSTY-LEAVED FIG—Code 1

Other *Ficus* with small leaves worth trying include: *F. benjamina* 'Exotica', *F. natalensis*, *F. philippinensis*, *F. religiosa*, *F. celebensis*.



Ficus microcarpa 'Green Island'.

FORTUNELLA HINDSII—HONG KONG KUMQUAT—Code 3

A dwarf tree. Needs cool, dry winters and bright light to produce small oranges (kumquats).

F. MARGARITA—NAGAMI KUMQUAT—Code 3
Culture as above.

FUCHSIA FULGENS—FUCHSIA—Code 3
Needs cool winters. Keep moist when growing. Attractive red flowers hang down. Develops a trunk slowly.

F. MACELLANICA—HARDY FUCHSIA—Code 3
Culture as above.

GARDENIA JASMINOIDES—GARDENIA—Code 2
Needs acid soil and fertilizer. Provide high humidity and keep evenly moist. Mist frequently. Maintain temperature between 60 degrees F and 70 degrees

F. Has very fragrant white flowers. Cold drafts will cause bud blast or drop.

GREVILLEA ROBUSTA—SILKY OAK—Code 2
Pinnate leaves with orange flowers. Give high humidity and keep moist. Cool winter temperature to 55 degrees F. Bright light. Easy.

G. BANKSII—Code 2
Has red flowers. Culture as above.

GUAIAECUM OFFICINALE—LIGNUM VITAE, POCKWOOD TREE—Code 2
Needs very bright light to flower. Has true blue flowers. Keep moist. Needs a slightly acid soil. Very hard, heavy wood. Train by pruning. Branches are hard.

G. SANCTUM—Code 2
Deep green, oblong leaves. Native to Florida. Culture as above.

HEDERA HELIX—ENGLISH IVY—Code 3

Very slow trunk thickening. Easily grown in house. Many leaf variations.

HIBISCUS ROSA-SINENSIS—ROSE-OF-CHINA—Code 1

Easy to grow. Has large leaves and flowers. Acid fertilizer and bright light induce flowering. Keep moist. Prune after flowering.

H.R-S 'COOPERI'—CHINESE HIBISCUS—Code 1

Has smaller flowers and is variegated. Culture as above.

H. TILIACEUS—MAHOE—Code 1

Can take warmer winter temperatures. Culture as above.

ILEXAQUIFOJUM 'ANGUSTIFOLIA'—HOLLY—Code 3

Narrow leaved English holly. Needs cold winters to 45 degrees F. Difficult.

I. CRENATA 'HELLERI'—JAPANESE HOLLY—Code 3

Conditions and culture as above.

I. CORNUTA—CHINESE HOLLY—Code 3

Conditions and culture as above.

I. VOMITORIA 'NANA'—DWARF YAUPON HOLLY—Code 3

Used as an emetic by Indians. Can take somewhat warmer temperatures in winter.

IXORA JAVANICA—JUNGLE GERANIUM—Code 1

Has clusters of scarlet flowers. All varieties need acid soil and very bright light to flower. Add iron if leaves become chlorotic. Give high humidity and keep warm.

I. COCCINEA—FLAME-OF-THE-WOODS—Code 1

Has red flowers. Culture as above.

JACARANDA ACUTIFOLIA—FALSE MIMOSA—Code 1

Has pinnate leaves and showy lavender-blue flowers. Difficult to flower; supply very high light and keep very moist. Flowers are on branch tips, so prune after flowering.

JASMINUM DICHOTOMUM—PINWHEEL JASMINE—Code 2

There are many jasmines and most require warm, moist conditions and slightly acid soil. Add chelated iron if they become chlorotic. Most have very fragrant flowers.

JUNIPER CHINENSIS 'NANA'—Code 3

Needs neutral to slightly acid soil and cool conditions. Very cool rest in winter. Difficult.

J. SQUAMATA 'PROSTRATA'—Code 3

Conditions and culture as above.

LAGERSTROEMIA INDICA—GRAPE MYRTLE—Code 3

Needs high light to flower. Keep moist; treat to prevent fungus. New dwarf varieties are more fungus resistant. Train by pruning. It has tender bark.

LANTANA CAMARA—LANTANA—Code 2

Grows outdoors very easily and rapidly in S. Florida. High humidity and bright light induce almost constant flowering. do not allow to go dry. Feed frequently with half-strength fertilizer. Easy.

L. MONTEVIDENSIS—WEEPING LANTANA—Code 2

Culture as above.

LAURUS NOBILIS—LAUREL, BAY—Code 3

True laurel. Needs cool winter temperatures and bright light.

LEPTOSPERMUM SCOPARIUM—AUSTRALIAN MYRTLE, NEW ZEALAND TEA TREE—Code 3

Needlelike leaves; small pink to red flowers like miniature roses. Keep moist, cool and give high light. Prune roots lightly.

LIGUSTRUM JAPONICUM—JAPANESE PRIVET—Code 3

Shiny evergreen leaves. Fragrant white flowers. Needs bright light, cool winter temperatures. High summer temperatures require high humidity.

L. J. ROTUNDIFOLIUM—JAPANESE PRIVET—Code 3

Culture as above.

L. LUCIDUM—GLOSSY PRIVET—Code 3

Has white flowers. Culture as above.

LONICERA NITIDA—BOX HONEYSUCKLE—Code 3

Small evergreen leaves; fragrant white flowers. Grows fast. High light and cool winter temperatures needed.

* **MALPIGHIA COCCIGERA**—MINIATURE HOLLY, SINGAPORE HOLLY—Code 1

Leaves resemble holly. Light pink flowers and rough, speckled bark. Bright light and warm temperatures help flowering. Keep temperatures above 55° F and do not allow to dry out.

M. GLABRA—BARBADOS CHERRY—Code 1

Fruits are edible and very high in vitamin C. It is somewhat weeping in habit. Trunk thickens slowly. Give it slightly acid soil. Recommended.

M. PUNICIFOLIA—Code 1

Similar to *M. glabra* but inedible fruit. Culture as above.

* All malpighias are easily grown and are recommended.

MELALEUCA QUINQUENERVIA—PAPER BARK TREE—Code 1

Attractive exfoliating gray-white papery bark. Keep warm, bright light.

MURRAYA PANICULATA—ORANGE JESSAMINE—Code 3

Hedge plant in S. Florida. Give high light and cool winter. Flowers are white and fragrant. Water well. Do not allow to dry.

MYRCIARIA CAULIFLORA—JABOTICABA—Code 2

Small leaves; brown exfoliating bark. Needs acid soil pH 5.5-6.0. Fertilize with chelated iron and trace elements. Unusual white flowers and dark purple-blue fruits are produced directly on the trunk and branches. Fruits are sweet and make good jelly. Difficult to flower in a bonsai container. Must be 8-10 years old minimum. Give very high light.

MYRSINE AFRICANA—AFRICAN BOXWOOD—Code 3

Dark green round leaves. Resembles boxwood. Red stems, leaves reduce to one-quarter inch.

MYRTUS COMMUNIS—MYRTLE—Code 3

Evergreen leaves with a spicy aromatic scent. Small flowers, blue-black berries. Keep moist. Breaks new shoots from trunk. Cool winter.

M.C. 'MICROPHYLLA'—DWARF MYRTLE—Code 3

Small leaved variety. Culture as above.

NOTHOFAGUS CUNNINGHAMII—TASMANIAN BEECH—Code 3

Has very small leaves. Keep cool in winter; do not overwater but don't let go dry. Needs good light.

***OLEA EUROPAEA*—OLIVE—Code 3**

Old bark is very attractive. Strong bright light, cool winter to 45° F. Let top of soil dry between watering. Takes home temperature to 75° F in summer, but provide high humidity or mist.

***OSMANTHUS FRAGRANS*—SWEET OLIVE—Code 3**

Evergreen, fine-toothed glossy leaves. Tiny fragrant cream-colored flowers. Keep cool in winter. Keep moist. Prune to let air flow through.

***PINUS ELLIOTTII*—SLASH PINE—Code 2**

Native of S. Florida. Has long needles in bundles of 2 or 3. Needs good drainage. Reduce tap root gradually. New growth breaks on old wood. Needles will reduce with good bonsai culture.

***P. HALEPENSIS*—ALEPPO PINE—Code 3**

Native of the Mediterranean basin. It can adapt better than other pines to home heat and dryness. Give bright light, keep slightly moist but do not overwater. Keep cool in winter. Repot every 2–3 years. A slow grower.

***P. THUNBERGIANA*—JAPANESE BLACK PINE—Code 3**

A two-needle pine. Needs a cold rest period—40°–45° F and cold conditions. Needs bright light and high humidity with good drainage. Many cultivars are available with shorter needles, closer internodes and interesting bark. Very difficult.

***PISTACIA TEREBINTHUS*—PISTACHIO, CYPRUS TURPENTINE—Code 2**

Evergreen pinnate leaves. Needs very bright light and cool temperatures. Allow top soil to dry slightly between waterings.

***PITHECELLOBIUM FLEXICAULE*—TEXAS EBONY—Code 2**

Light green compound leaves. A slow grower. Can take reduced light and tolerates heat. Keep moist.

***P. UNGUIS-CATI*—CAT'S CLAW, BLACK BEAD—Code 2**

Bi-pinnate leaves, small yellow flowers, claw-like seedpods. Prune rather than wire.

***PITTIOSPORUM TOBIRA*—JAPANESE PITTOSPORUM—Code 3**

Evergreen dense shiny dark green leaves. White fragrant flowers. Needs bright light and cool conditions. Shape by pruning. Keep moist.

***PODOCARPUS MACROPHYLLUS MAKI*—BUDDHIST PINE, JAPANESE YEW, SOUTHERN YEW—Code 3**

Needs bright light and good drainage. Leaves like fat needles will reduce, but select for leaf size. Buds break on trunk. Keep evenly moist. High humidity.

***P. GRACILIOR*—African fern pine—Code 3**
Weeping form. Culture as above.

***PORTULACARIA AFRA*—ELEPHANT BUSH—Code 3**

Needs good drainage and very high light for compact growth. Pinch regularly. Water moderately. Allow top soil to dry between waterings. Shape by pruning.

***PSIDIUM LITTORALE* VAR. *LONGIPES*—STRAWBERRY GUAVA—Codes 2–3**

Interesting mottled exfoliating bark. Evergreen leaves, white flowers and red edible fruit to 1". Water well and then allow surface of soil to dry. Soil slightly acid, pH 5.5. to 6.5.

***P. GUAJABA*—GUAVA—Code 2-3**
Leaves to 4". Culture as above.

PUNICA GRANATUM 'NANA'—DWARF POMEGRANATE—
Code 2

Tiny green leaves. Give high light and heat to induce flowering. Blow into flowers to pollinate. Keep moist. Prune after flowering as it blooms on ends of branches. Snickers freely. Easy to grow.

PYRACANTHA ANGUSTIFOLIA—FIRETHORN—Code 3

Attractive white clusters of flowers becoming red-orange berries. They tolerate heat and dryness. Slightly alkaline soil.

P. COCCINEA—SCARLET FIRETHORN
Scarlet fruit. Culture as above.

P. FORTUNEANA
Small leaves and many little red berries.
Culture as above.

P. KOIDZUMII
Large berries. Culture as above.

QUERCUS SUBER—CORK OAK—Code 3
From the Mediterranean basin. Needs cool to cold winters. Give high light and humidity. Slow growers. Prune lightly, repot every third year. Difficult.

Q. AGRIFFOLIA—CALIFORNIA LIVE OAK
Culture as above.

Q. NIGRA—WATER OAK
Culture as above.

Q. VIRGINIANA—SOUTHERN LIVE OAK
Culture as above.

RAPHIOLEPIS INDICA—INDIAN HAWTHORN—Code 2
Slow growing, has leathery leaves, white to pink flowers and blue-black fruit.

Brittle to wire, needs cool conditions, but stands warmth.

R. UMBELLATA—YEDDO HAWTHORN—Code 2.
Culture as above.

RHODODENDRON—AZALEAS—Code 3
Need good light, cool temperature and acid soil. Soil can be from half to all peat moss. All need a cool dormant period in winter. Choose one with small leaf. Bark is thin and easily injured. Use paper-wrapped aluminum wire. Strong bottom growth requires pruning to force top growth.

ROSMARINUS OFFICINALIS—ROSEMARY—Code 3
Evergreen aromatic needlelike leaves, develops a woody trunk slowly. Needs high humidity and cold winters. Keep moist. High light when growing.

R. O. PROSTRATUS'—Code 3
A good variety. Culture as above.

SAGERETIA THEA (*S. THEEZANS*)—POOR MAN'S TEA—Code 2
Mottled bark, small shiny pale green leaves. Grows quickly. Keep evenly moist. Give high light and humidity. Mist frequently in summer.

SEQUOIA SEMPERVIRENS—COAST REDWOOD—Code 3
Feathery fronds, intriguing bark, needs high light, high humidity. Cool to cold winter temperatures. Breaks new buds on older wood. Difficult.

SERISSA FOETIDA—SNOW ROSE, TREE OF A THOUSAND STARS—Code 2
Pinch long, leggy growth constantly. Keep warm, bright light and high humidity. Keep moist; do not let dry. Trunk thickens slowly. Single- and double-flowered forms available. Easy.

SEVERINIA BUXIFOLIA—CHINESE BOX
ORANGE—Code 3

Small leaves; needs high light and cool temperatures. Branches are brittle. Wire carefully.

SYZYGIUM PANICULATUM (*EUGENIA PANICULATA*)—BRITISH CHERRY—Code 3

Evergreen leaves, creamy colored flowers and rose to purple berries. Needs good light, slightly acid soil. Keep moist. Recommended.

TABERNAEMONTANA DIVARICATA—GRAPE JASMINE, FLEUR D'AMOUR—Code 2

Gnarled, gray trunk; glossy green leaves, twisted white flowers. Single and double varieties. keep warm with bright light.

T. DIVARICATA 'CASHMERE'—PINWHEEL JASMINE—Code 2

Pure white pinwheel flowers, can take less light. Culture as above.

TAXODIUM DISTICHUM—BALD CYPRESS—Code 3

Give cool dry conditions in winter to rest and induce leaf drop. When growing, water well and give bright light. Difficult.

TRACHELOSPERMUM JASMINOIDES—STAR JASMINE, CONFEDERATE JASMINE—Code 1

Has very fragrant white flowers and leathery foliage. Pinch the new growth. Needs cool conditions and high humidity. Allow top soil to dry between waterings.

TRIPHASIA TRIFOLIA—LIMEBERRY—Code 1

Keep warm and water well but in winter keep it on the dry side. Bright light. Trunk thickens slowly.



SUGGESTED READING

Compiled by Guest Editor, Sigmund Dreilinger,
with assistance from Brooklyn Botanic Garden librarian,
Deborah Krupczak

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